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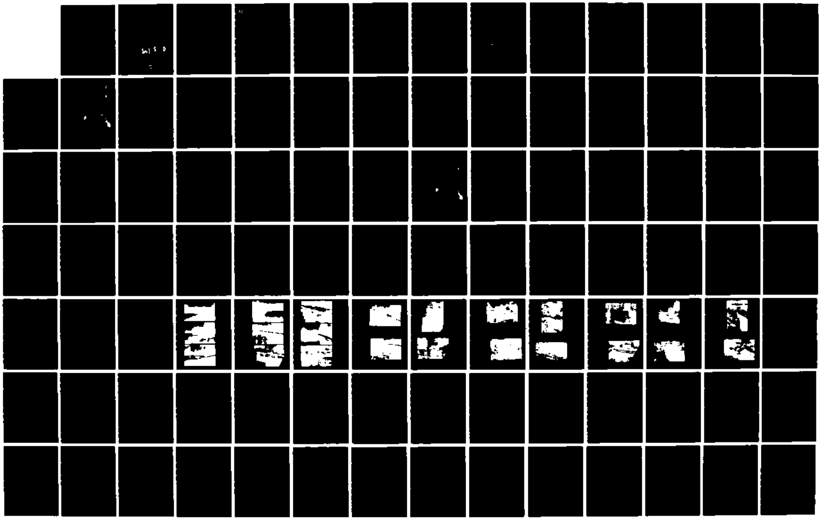

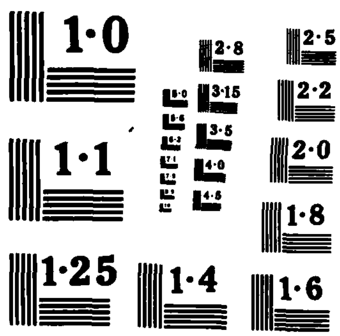
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AD-A154 497

HOUSATONIC RIVER BASIN
WASHINGTON, MASSACHUSETTS

ASHLEY LAKE DAM
MA 00313

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

FEBRUARY 1980

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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Housatonic River Basin
Washington, Massachusetts
Ashley Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The entire dam is about 850 feet long and has two angle points along its face. The center portion of the dam is of stone masonry construction flanked by earthen embankments on each side. The dam is intermediate in size and its hazard classification is high. The test flood for this dam is the Probable Maximum Flood. The dam was found to be in poor condition. Failure of the dam will result in serious damage to 3 homes.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION. CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM. MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

MAR 06 1981

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Ashley Lake Dam (MA-00313) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, City of Pittsfield, Pittsfield, MA 01201.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

C. E. Edgar III

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

ASHLEY LAKE DAM

MA 00313

HOUSATONIC RIVER BASIN

WASHINGTON, MASSACHUSETTS

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Indentification No.:	MA 00313
Mass. D.P.W. No.	1-2-313-1
Name of Dam:	Ashley Lake Dam
Town:	Washington
County and State:	Berkshire County, Massachusetts
Stream:	Ashley Brook
Date of Inspection:	November 7, 1979

BRIEF ASSESSMENT

The Ashley Lake Dam is located at the northern end of Ashley Lake which is approximately six (6) miles southeast of the City of Pittsfield, Massachusetts. The dam was constructed as part of the water supply system for the City of Pittsfield and serves as a means of storage for the new Ashley Reservoir system. The center portion of the dam is of stone masonry construction flanked by earthen embankments on each side which are about 0.5 feet higher than the stone masonry section. The structure has a stone masonry center spillway and a gate house which are located to the left of center of the dam. Two (2'-¼" square opening) sluice gates beneath the gate house provide controlled release of impounded water to the downstream intake reservoir (Ashley Reservoir). The spillway crest is twelve (12) feet long and is 2.7 feet below the top of the dam and has provisions for stop logs about 1.0 feet high above crest. The entire dam is approximately 850 feet long and has two angle points along its face. The earthen embankment to the left is approximately 135 feet long and is at a slight angle to the stone masonry section. The stone masonry section is approximately 465 feet long, 100 feet of which is constructed at an angle of about 139° to main section. An earthen embankment approximately 250 feet long begins at the right end of the stone masonry section and makes the transition to natural soil at the right abutment of the dam. The dam is 21 feet high to top of dam at the center spillway and its downstream channel is known as Ashley Brook.

The City of Pittsfield owns the Ashley Lake Dam and its Water Department regulates the control gates and spillway mode of operaton. A Water Department employee visits the site when required to adjust the sluice gates to maintain required water levels in the downstream Ashley Reservoir.

The drainage area affecting the Ashley Lake Dam is approximately 0.64 square miles and is comprised of heavily wooded, rolling terrain. The dam impounds approximately 1,100 acre feet at the normal pool elevation of 1924 feet MSL and 1400 acre feet at the top of the dam elevation of 1926.7 feet MSL. The dam is INTERMEDIATE in size and its hazard classification is HIGH.

The test flood for this dam is the Probable Maximum Flood (PMF). For this drainage area the PMF is 1,600 cfs. When this flood is routed through the reservoir, the resulting outflow is 725 cfs. The control gates and spillway have a combined discharge capacity of about 400 cfs

with the water level at the top of the masonry dam section. This is without the stop logs installed. With stop logs the capacity is reduced to about 320 cfs. The routed PMF test flood exceeds the spillway capacity and results in overtopping the stone masonry section of the dam by about 0.4 feet without the stop logs and 0.6 feet with the stop logs in place.

Routing 50% of the PMF test flood results in a spillway outflow of about 320 cfs which will allow about 1.0 feet of remaining freeboard to the top of the stone masonry section of the dam if the stop logs are removed. With the stop logs in place, the water level will be just at the top of the stone masonry section of the dam and overtopping will be imminent.

Failure of the dam will result in serious damage to 3 homes with attendant probable loss of more than a few lives as well as severe damage to one primary and one secondary road.

The dam was found to be in POOR condition. Remedial measures to be undertaken by the owner include: backfill animal burrow holes, remove stumps, trees, and brush from the upstream and downstream faces of the dam, mow earthen embankment slopes, remove debris from the downstream channel and repair the stone training wall along the downstream channel.

There are a number of areas that warrant further investigation. The leakage from the downstream face of the dam should be investigated to determine a suitable means of repair. The upstream face of the dam has extensive spalling along its entire length and this condition should be corrected in conjunction with the repair of the leakage on the downstream face of the dam. The area along the toe of the downstream slope of the dam is very wet and the source of this water should be determined. Further hydraulic and hydrologic studies should be carried out to determine the adequacy of spillway capacity; until these studies are completed, the installation of stop logs on the spillway crest should be discontinued.

The recommendations and the remedial measures outlined above should be implemented within one year of the receipt of this report by the Owner.

John W. Powers
Sanitary

John W. Powers
Massachusetts Registration 23106

This Phase I Inspection Report on ASHLEY LAKE DAM (MA-00313) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joe Finegan

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

Aramast Mahtesian

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspecton, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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APPENDICES

(c) Appurtenant Structure

1) Gate House (See photos 3, 4, 6, 18, & 21)

The gate house is a 16 foot by 16 foot brick structure which is located to the right of the spillway. It is in relatively good condition. However, there is extensive spalling at the base of the gate house along the upstream face of the dam. Inside there is a floor board missing but everything else appears to be in good shape. The wheel operated 26 inch sluice gates have been recently operated. There is a 6" x 8" beam with a pulley used to lower and raise the two 3'8" by 4'10" wooden slide gates. The slide gates were fully opened at the time of our inspection. During normal operation one sluice gate is completely closed, one sluice gate is slightly opened and both slide gates are fully opened. Also, there is an 8 inch gate valve which regulates flow from one chamber to the other. There were no visible model numbers on any of the equipment.

2) Outlet Conduit

The outlet conduits are two 2'1¼" by 2'1¼" stone channels which are regulated by the two sluice gates. During the inspection, access to these channels was not possible. Therefore, we cannot comment on the condition of these conduits.

(d) Reservoir Area (See photos 1 & 4)

The shore of the reservoir is generally shallow sloping woodland. It appears stable and in good condition. There is no significant debris along the upstream face of the dam or along the upstream slope of the embankments.

(e) Downstream Channel (See photo 21, 22, & 23)

The downstream channel is a narrow channel between two stone training walls which then passes through a 48 inch diameter culvert beneath the access road. Downstream of the access road the channel flows through moderately sloping woodland and becomes Ashley Brook.

The stone training wall is laid dry and there is some erosion of the soil behind the wall. Also there is a section of wall which has collapsed into the channel. This section is located downstream of the spillway where the channel begins to narrow.

There is some debris in the channel. The debris is primarily small stones which may have washed down from the collapsed section of the retaining wall.

The soil at the base of the stone section is covered by long grass, weeds and brush. There is a wet area at the base of the stone section at the bend. The entire area downstream of the dam between the bend and the spillway is comprised of very poor material and the area is very wet. Photo 11 shows the ponding at the toe of the earth embankment downstream of the stone masonry section. The area also has an extensive growth of evergreen trees on the downstream earth embankment. The entire area below the dam is poorly graded and is poorly drained.

3) <u>Spillway</u> See photos 7, 12, 19, 20, & 21)

The spillway is located approximately 170 feet from the left abutment of the stone masonry section. The spillway has a stone approach section comprised of five blocks of granite which slope upward and become the crest of the spillway. Below the crest is a broad crested weir section constructed of stone with two stone walls on each side of the spillway.

The spillway is in good condition, however, the stone walls along the side of the spillway have grass and weeds growing in the joints. The wall to the left shows some signs of minor seepage from the earthen embankment below the base of the stone section.

There are two stoplogs across the spillway and these logs are in fair condition. The stoplog guides mounted on the spillway are in relatively good condition.

4) <u>Right Embankment</u> (See Photos 1 & 2)

The right embankment is in fair condition. The upstream slope is partially protected by riprap and both the upstream and downstream slopes are covered with tall grass and weeds. There are three animal holes along the downstream slope and they are located as follows: approximately at the right abutment, 45 feet from the right abutment and 18[illegible] feet from the right abutment. Along the toe of the downstream slope there is a wet and very soft area located about 150 feet from the right abutment.

There was no evidence of erosion along either the upstream or downstream slope but much of the area was completely covered by the tall grass and weeds. Evergreen trees are growing in two sections below the embankment as shown on the aerial overview photo.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

(a) General

The Ashley Lake Dam No. MA 00313, was in POOR condition at the time of the inspection.

(b) Dam

1) Left Embankment (See photos 8 & 9)

The upstream slope is partially protected by riprap and is in fair condition. For the most part, the upstream slope has a good cover of grass and trees. There was no evidence of any significant debris along the upstream slope.

The downstream slope of the embankment was also covered by long grass and weeds. There are two evergreen trees growing in the right of the embankment, near the left end of the stone masonry section (see photo 9).

There was no evidence of erosion on either the upstream or downstream slopes of the embankment and there was no evidence of any animal holes on either slope.

2) Stone Masonry Section (See photos 1, 3, 4, 5, 6, 7, 8, 10, 13, 14, 15, 16, & 17)

The upstream face of the stone masonry section is in poor condition. The concrete that is visible on the upstream face has extensive spalling. Some of the sections of spalling have caused cavities up to 8 inches in depth. The entire upstream face shows considerable deterioration.

The stone capping on the top of the stone masonry section is in good condition and there is no visible evidence of cracking along the length of the dam.

The downstream face is in poor condition. There are two leaks located approximately ten and twenty-five feet from the left abutment of the stone masonry section. There is also a stone missing at the twenty-five foot location. Another leak was noticed at the bend in the stone masonry section about 6.5 feet below the top of the dam. There was minor leakage visable along the entire downstream face of the dam between the spillway and the bend in the stone section.

The entire downstream face of the stone masonry section has weeds and brush growing in the joints between the stones. It appeared that there may have been a slight lateral movement approximately 50 feet to the left of the spillway. However, this might be the original alignment of the stones.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

Design data for the Ashley Lake Dam is not available. Plans for the Ashley Lake Dam are available and are listed in Appendix B. The dam was designed by E.A. Ellsworth, Consulting Engineer, of Holyoke, Massachusetts around 1900.

2.2 Construction Data

The design plans available for this dam show good agreement with the visual inspection. These plans are listed in Appendix B of this Report.

Construction data is not available for the Ashley Lake Dam.

2.3 Operation Data

There is no operational data available for the Ashley Lake Dam.

2.4 Evaluation of Data

The hydraulic and hydrologic design data was not sufficient to satisfy the requirements of the Corps of Engineers "Recommended Guidelines." Therefore, hydraulic and hydrologic calculations were carried out as part of this Phase I Investigation and are discussed in Section 5 and detailed in Appendix D.

Seepage and stability analyses comparable to the requirements of paragraph 4.4 of the "Recommended Guidelines" are not available for the Ashley Lake dam. Additional computations for seepage and stability analyses have not been developed for this report, since this is beyond the scope of the Phase I Inspection program.

(i) <u>Spillway</u>

1) Type:

a) Spillway: Center spillway with broad crest weir section

b) Emergency Spillway: None

2) Length of weir:

a)	Pond drain inlet:	2-2'-1¼" square channels with sluice gates
b)	Spillway:	.12 feet
c)	Emergency spillway:	None

3) Crest elevation:

a)	Pond drain inlet:	1,909.2
b)	Spillway inlet:	1,924 without stop logs (1925 with stop logs)
c)	Emergency spillway:	None

4) Gates: 2 2'-1¼" inch sluice gates on pond drain inlet.

5) Upstream Channel:

a)	Spillway:	Reservoir
b)	Emergency spillway:	None

6) Downstream Channel:

a) Spillway: Center spillway discharging to basin downstream of spillway

b) Emergency spillway: None

(j) <u>Regulating Outlets</u>

1) Invert: 1,909.2 feet MSL

2) Size: Two 2'-1¼" square channels

3) Description: Both channels are 4 ft. by 4 ft. channels approximately 10 feet in length from the face of the dam to the wooden slide gates. Beyond the slide gates the channel narrows to 3 feet and then expands to 5 feet. At this location the two channels are interconnected by an 8 inch diameter pipe regulated by a gate valve. The downstream face of this channel has the sluice gates which regulate the flow through the two 2'-1¼" square channels which are about 13 feet long.

4) Control Mechanism: 2 - 3'8" x 4'10" slide gates
1 - 8" gate valve
2 - 2'1¼" square sluice gates

Gate data: None available

(e) Storage (acre-feet)

1) Normal pool: 1,100±

2) Flood control pool: N/A

3) Spillway crest pool: 1,100±

4) Top of dam: 1,400±

5) Test flood pool: 1,450±

(f) Reservoir Surface (acres)

1) Normal pool: 112±

2) Flood-control pool: N/A

3) Spillway crest: 112± without stop logs
116 with stop logs

4) Test flood pool: 125±

5) Top of dam: 120±

(g) Dam

1) Type: Earth Embankment & Stone Masonry

2) Length: 850± ft.

3) Height: 21± ft.

4) Top Width: 6± ft. stone masonry section
10± ft. earth embankment sections

5) Side Slopes: Upstream 2.5 to 1 (embankment)
Downstream 1.5 to 1 (embankment)

6) Zoning: Type of Material Not Known

7) Impervious Core: Concrete (20 to 28 inches wide)

8) Cutoff: Unknown

9) Grout curtain: None

(h) Diversion and Regulating Tunnel

Not applicable

both fully open sluice gates. If stop logs are installed the spillway capacity is reduced 80 cfs for a total of 320 cfs.

9) Total Project Discharge at Test Flood Elevation

The total project discharge at test flood elevation (1,927.1 feet MSL NGVD) is approximately 725 cfs. This is a combined discharge including 170 cfs for the spillway, 230 cfs for the flow through both sluice gates and approximately 325 cfs which represents the flow overtopping the masonry section of the dam by 0.4 feet.

If stop logs are installed the total project discharge is 975 cfs with 110 cfs for the spillway, 230 cfs for the sluice gates and 635 cfs overtopping the masonry section of the dam by 0.6 feet.

(c) Elevation (ft. above MSL, NGVD)

1) Streambed at toe of dam: 1,905.7

2) Bottom of cutoff: unknown

3) Maximum tailwater: unknown

4) Normal pool: 1,924.0

5) Full flood control pool: 1,927.1 without stop logs. (1927.3 with stop logs)

6) Spillway crest: 1,924 (ungated) (1925 with stop logs)

7) Design surcharge: unknown

8) Top of dam: 1,926.7

9) Test flood surcharge: 1,927.1 (Dam overtopped by 0.4 ft)

(d) Reservoir (Length in feet)

1) Normal pool: 5,000±

2) Flood control pool: N/A

3) Spillway crest pool: 5,000±

4) Top of dam: 5,050±

5) Test flood pool: 5,080±

(b) Discharge at Damsite

1) Outlet Works

Normal discharge at the site is via the two 2'-1¼" square openings in the base of the gate house at elevation 1909.2±. This discharge is to the impact basin located just downstream of the principal spillway. In the event of flood flows, excess flow would discharge over the spillway at elevation 1924 feet (MSL). It has been assumed that the normal pool elevation is at the crest of the spillway and that this elevation is 1924 feet above mean sea level. The U.S.G.S. map shows the water level at this elevation and we have related all dam features to this datum. The existing plans are based on an assumed datum which cannot be directly related to mean sea level.

2) Maximum Known Flood at Damsite

There is no data available for the maximum known flood at this damsite.

3) Ungated Spillway Capacity at Top of Dam

The capacity of the spillway with the reservoir at top of dam elevation (1926.7 feet MSL NGVD) is approximately 170 cfs.

4) Ungated Spillway Capacity at Test Flood

The capacity of the spillway with the reservoir at test flood elevation (1,927.1 feet MSL NGVD) is approximately 170 cfs without stop logs. With stop logs, the capacity is 110 cfs.

5) Gated Spillway Capacity at Normal Pool Elevation

When both sluice gates are open, they have capacity of approximately 215 cfs at normal pool elevation.

6) Gated Spillway Capacity at Test Flood Elevation

When both sluice gates are open, they have capacity of approximately 230 cfs at test flood elevation.

7) Total Spillway Capacity at Test Flood Elevation

The total spillway capacity at test flood elevation (1,927.1 feet MLS NGVD) is approximately 400 cfs, without stop logs. With stop logs, the capacity is 320 cfs.

8) Total Project Discharge at Top of Dam

The total project discharge at top of dam (1,926.7 feet MSL NGVD) is approximately 400 cfs. This is a combined discharge including 170 cfs for the spillway and 230 cfs for the flow through

(d) Hazard Classification

The hazard potential classification for this dam is HIGH because of the economic losses and potential for loss of life downstream which may occur in the event of dam failure. There is a high potential for severely damaging about three (3) homes with attendant probable loss of more than a few lives as well as one primary and one secondary road.

(e) Ownership

The Ashley Lake Dam is owned by the City of Pittsfield represented by its Board of Water Commissioners. Their offices are at City Hall, 70 Allen Street, Pittsfield, Massachusetts 01201.

(f) Operator

The Ashley Lake dam is operated by the City of Pittsfield through its Water Department. The Superintendent of the Water Department is Mr. Alfonso Yovis, who can be reached by telephone at (413) 443-6112. The night number is: (413) 442-0921.

(g) Purpose of the Dam

The purpose of the dam is to provide raw water storage for the City of Pittsfield. Water is stored in Ashley Lake, released through the sluice gates, and flows down Ashley Brook into Ashley Reservoir where it enters the water supply system of the City of Pittsfield.

(h) Design and Construction History

The dam was designed by E.A. Ellsworth, a Consulting Engineer of Holyoke, Massachusetts. The Ashley Lake Dam was built in 1901.

(i) Normal Operating Procedure

Water releases from Ashley Lake are varied through manual adjustment of the two (2) sluice gate openings as demand dictates.

1.3 Pertinent Data

(a) Drainage Area

The drainage area for this dam covers approximately 0.64 square miles. It is primarily comprised of heavily wooded land with rolling hills. There are no developed areas within the drainage area.

3) <u>Principal Spillway</u>

The principal spillway consists of a stone masonry approach and broad crested weir section which are approximately 170 feet from the left end of the stone masonry section. The spillway crest is 12 feet long and is 2.7 feet below the top of the dam.

Stop logs can be installed at the crest of the spillway to raise the water level to within about 1½ feet of the top of the dam.

4) <u>Gate House</u>

A 16 feet by 16 feet brick gate house is located to the right of the spillway and provides the means to regulate the water level in the Lake. Two 2'-1¼" square openings with sluice gates allow water to discharge in the impact basin to the right of the spillway. By adjusting the sluice gates, the operator can set the discharge rate and thus regulate the quantity of water released to the downstream intake reservoir. The gates can also be used to regulate the water level in storage behind the dam.

5) <u>Right Embankment</u>

The embankment is approximately 250 feet long and is a maximum of 10 feet high. The upstream slope is 2.5 horizontal to 1 vertical; the downstream slope is 1.5 horizontal to 1 vertical; the width of the top of the dam is approximately 10 feet.

The available design and construction data do not describe the type of material used to construct the embankment. This embankment also has a vertical concrete core wall which varies in width from 20 inches at the top to 24 inches at the mid point to 28 inches at the base. This wall varies in depth as shown on the "Elevation of Ashley Lake Dam" included in Appendix B.

Riprap covers most of the entire length of the upstream slope and provides erosion protection. The riprap is 1' to 2' diameter stone.

(c) <u>Size Classification</u>

The dam's maximum impoundment (computed to the top of the dam) of approximately 1,400 acre feet and height of 21 feet place it in the INTERMEDIATE size category according to the Corps of Engineers' Recommended Guidelines.

1.2 Description of Project

(a) Location

The Ashley Lake Dam is located at the northern end of Ashley Lake, which is approximately 6 miles southeast of Pittsfield, Massachusetts. It can be reached from Pittsfield by taking William Street to the Hinsdale townline and following Washington Mountain Road to the Washington townline where it becomes Pittsfield Road. Ashley Lake is approximately two miles south of the Washington townline and about 1/4 mile west of Pittsfield Road. The dam is shown on the U.S.G.S. Pittsfield East Quadrangle Map. The dam is located at approximately N 42°-23'-20" latitude and W 73°-09'-55" longitude (see Locus Map).

(b) Description of Dam and Appurtenances

The dam consists of a stone masonry center section with flanking earth embankments approximately 6 inches higher than the stone masonry center section, a stone masonry center spillway and a brick gate house. The total length of the dam is approximately 850 feet and the spillway crest is 12 feet long.

1) Left Embankment

The earth embankment is approximately 135 feet long and is a maximum of about 6 feet high. The upstream slope is 2.5 horizontal to 1 vertical; the downstream slope is 1.5 horizontal to 1 vertical; the width at the top of the dam is approximately 10 feet.

The available design and construction data do not describe the type of material used to construct the embankment. Within the embankment is a vertical concrete core wall which varies in width from 20 inches at the top to 24 inches at the mid point to 28 inches at the base. This wall varies in depth as shown on the "Elevation of Ashley Lake Dam" included in appendix B.

Riprap covering most of the entire length of the upstream slope provides erosion protection. The riprap is 1' to 2' diameter stone.

2) Stone Masonry Section

The available plans do not provide any information regarding the material used for the construction of the stone masonry section of the dam. It is approximately 465 feet long and is a maximum of 21 feet high at the spillway and gate house. The upstream face is vertical; the downstream face was constructed with a batter of 4"/ft. and the width of the top of the dam is approximately 6 feet.

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

ASHLEY LAKE DAM

NO. MA 00313

SECTION 1

PROJECT INFORMATION

1.1 General

(a) Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Tighe & Bond/SCI has been retained by the New England Division to inspect and report on selected dams in Massachusetts. Authorization and notice to proceed were issued to Tighe & Bond/SCI under a letter of October 24, 1979 from Colonel William E. Hodgson, Jr., Corps of Engineers. Contract No. DACW-33-80-C-0005 has been assigned by the Corps of Engineers for this work.

(b) Purpose

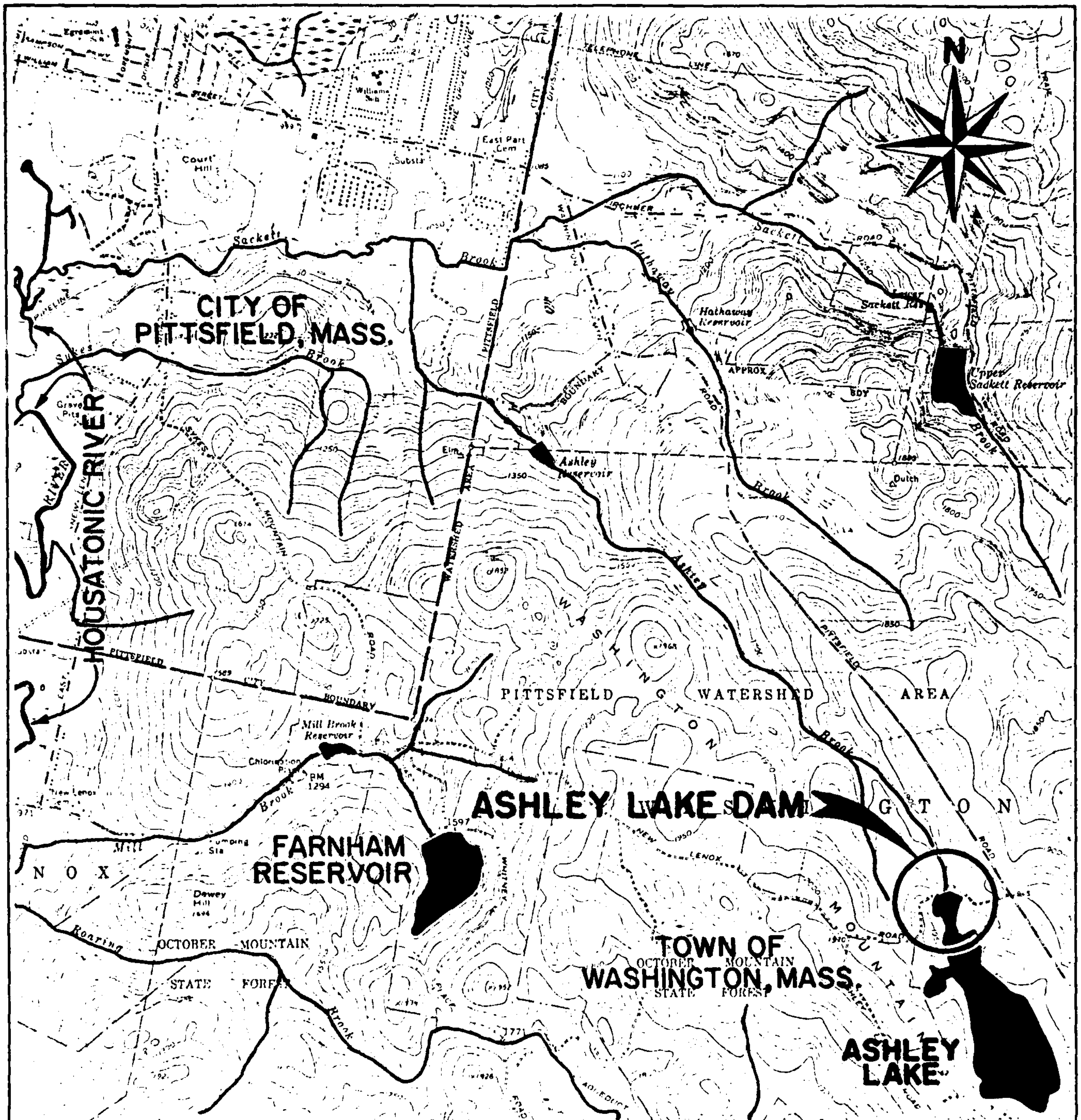
1) Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

2) Encourage and prepare the states to initiate quickly effective dam safety programs for non-federal dams.

3) Update, verify, and complete the National Inventory of Dams.

(c) Scope

The program provides for the inspection of non-federal dams in the high hazard potential category based upon location of the dams, and those dams in the significant hazard potential category believed to represent an immediate danger based on condition of the dams.



-SCALE-

1000' 0 1000' 2000' 3000' 4000' 5000'

FROM: U.S.G.S. PITTSFIELD EAST, MASS. QUADRANGLE MAP

QUADRANGLE LOCATION

TIGHE & BOND / SCI CONSULTING ENGINEERS EASTHAMPTON, MASS.	U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

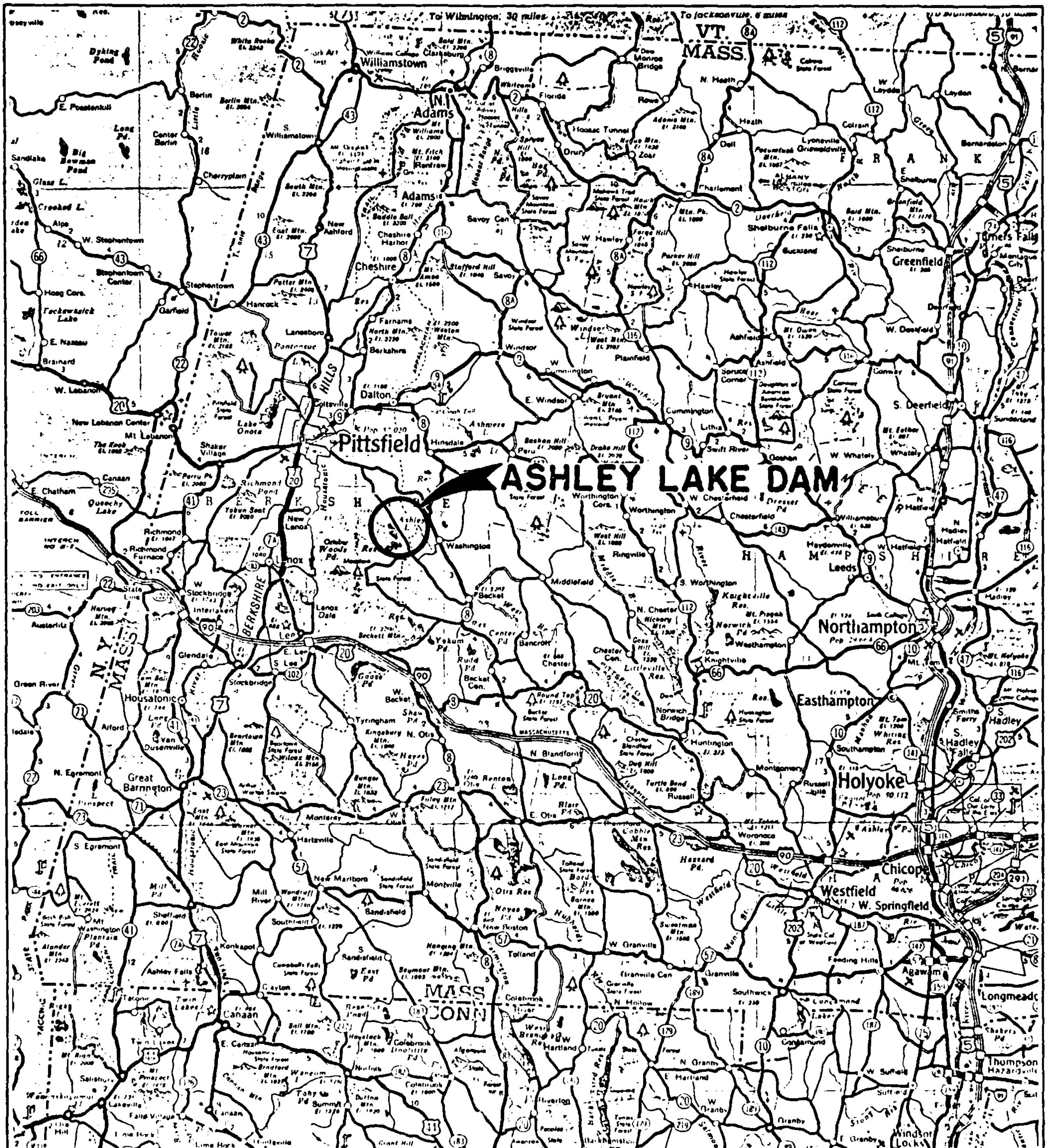
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCUS PLAN 2

ASHLEY LAKE DAM (MA 00313) WASHINGTON
BERKSHIRE COUNTY MASSACHUSETTS

SCALE: AS NOTED

DATE: FEBRUARY 1980



TIGHE & BOND / SCI CONSULTING ENGINEERS EASTHAMPTON, MASS.	U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

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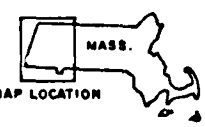
SCALE IN MILES



NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCUS PLAN I

ASHLEY LAKE DAM (MA 00313)
BERKSHIRE COUNTY

WASHINGTON
MASSACHUSETTS

SCALE : AS NOTED

DATE : FEBRUARY 1980

3.2 Evaluation

The dam is generally in POOR condition. The potential problems noted during the visual inspection are listed as follows:

a) Three significant leaks and numerous minor leaks were observed on the downstream face of the stone masonry section.

b) The downstream face of the stone masonry section has grass, weeds, and brush growing in the joints between the stones.

c) The upstream face of the stone masonry section has excessive spalling which has caused cavities up to 8 inches in depth. There is considerable deterioration of the upstream face of the stone masonry section.

d) Both earth embankment sections are covered with tall grass and weeds.

e) The downstream face of the left earth embankment has two evergreens growing very near the left end of the stone masonry section.

f) There are trees growing very close to the dam to the left of the spillway.

g) A section of the stone training wall has collapsed into the downstream channel.

h) There are evergreen trees growing very close to the stone masonry section near the bend in the dam.

i) There are three animal holes located on the downstream slope of the right earth embankment.

j) There is a wet area near the toe of the downstream slope of the right earth embankment.

k) There is a soft area near the toe of the earth embankment downstream of the stone masonry section located to the right of the bend in the section.

l) There is substantial seepage at the toe of the downstream face of the stone masonry section located to the right of the spillway. Water is ponding in this area and it appears that the soil is poorly drained.

m) There may be a slight lateral movement of the stone masonry located approximately 50 feet to the left of the spillway.

n) There is some minor debris in the downstream channel near the section of training wall that has collapsed.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

(a) General

No written operational procedures are available for this dam.

(b) Description of Any Warning System in Effect

There is no written warning system in effect.

4.2 Maintenance Prodecures

(a) General

There is no evidence that any maintenance has been done on this dam in many years.

(b) Operating Facilities

Operation of the sluice gates to regulate the release of water to Ashley Reservoir is the only mechanical item that must be exercised on a regular basis. At this time, the City of Pittsfield Water Department checks the water level of the intake reservoir and adjusts the setting of the sluice gates accordingly on a regular basis.

4.3 Evaluation

Detailed operating procedures should be developed since the dam is part of the City of Pittsfield water sypply system and emergency operation of the dam requires that a formal operating procedure be implemented. Regular maintenance inspections should be carried out at least annually.

Until the recommendations listed in Section 7.2 are completed, the installation of stop logs on the spillway crest should be discontinued.

A formal, written downstream emergency flood warning system should be developed.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The Ashley Lake Dam in Washington, Massachusetts is in the watershed of the Housatonic River. The dam is located approximately 3.5 miles upstream of the confluence of Ashley Brook and Sackett Brook. The upstream drainage area is approximately 0.64 square miles with rolling topography.

The dam itself is 850 feet long, with a stone masonry center section flanked by two earthen embankments which are approximately 6 inches higher than the masonry section. The spillway is located to the left of the center of the dam and consists of a stone approach and broad crested weir section. Two sluice gates regulate the water release to the downstream water supply intake reservoir (Ashley Reservoir). Flow proceeds under the gate house through a 26 inch square stone channel.

5.2 Design Data

There is no design data available for this review and the available plans were insufficient to determine all hydraulic and hydrologic features of the Ashley Lake Dam. The dam was designed by E.A. Ellsworth and the plans are based on an assumed datum. Since the U.S.G.S. mapping shows an elevation of 1924 (MSL) for the water level, it has been assumed that this is the elevation of the crest of the spillway and the normal pool elevation.

5.3 Experience Data

No records of flow or stage are known to be available for the Ashley Lake Dam No MA 00313.

5.4 Test Flood Analysis

The hydrologic conditions of interest in this Phase I investigation are those required to assess the dam's overtopping potential and its ability to safely allow an appropriately large flood to pass. This requires using the discharge and storage characteristics of the structure to evaluate the impact of an appropriately sized Test Flood. The original hydraulic and hydrologic design calculations are not available for inclusion in this Report.

Guidelines for establishing a recommended Test Flood based on the size and hazard classification of a dam are specified in the "Recommended Guidelines" of the Corps of Engineers. These guidelines state that dams classified as INTERMEDIATE in size and "HIGH" in hazard potential be tested against a Probable Maximum Flood (PMF) test flood.

The determination of the PMF for Ashley Lake is based on the Corps of Engineers "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase 1 Dam Safety Inspection" dated March 1978. The guide curves provided cover drainage areas as small as 2.0 sq. miles,

whereas, the Ashley Lake dam drainage area is only 0.64 sq. miles. Due to non-availability of data for a drainage area of this size, an extrapolation of the guidance curve has been used.

Graphically extending the guidance curve results in a unit discharge of 2475 CFS/sq. mile of drainage area which results in a PMF test flood of 1600 CFS for the Ashley Lake drainage area.

The test flood has been routed through the reservoir using the iteration process as outlined in the Corps of Engineers, "Preliminary Guidance for Estimating Probable Maximum Discharges in Phase 1 Dam Safety Inspection." The Ashley Lake Dam has a relatively large impoundment area and, consequently, a relatively large available surcharge storage for the small drainage area of the watershed. This, in effect, significantly dampens out the spillway outflow related to the test flood. Routing the PMF test flood of 1600 CFS through the reservoir results in a spillway outflow of approximately 725 CFS. This routing assumes that the level of the pond at the start of the storm is at the crest elevation of the spillway and that the stop logs are not in place. If the stop logs are installed and the pond elevation is at the top of the stop logs (elevation 1925±) at the beginning of the storm, then the routed PMF test flood results in a spillway outflow of approximately 975 CFS.

The combined spillways have a capacity of approximately 400 CFS without stop logs and 320 CFS with stop logs with the pond elevation at the top of the masonry section of the dam. The routed PMF test flood will exceed the capacity and overtop the masonry section of the dam by about 0.4 ft. without stop logs in place and 0.6 feet with the stop logs in place. Since the earth embankment sections are about 0.5 feet higher than the stone masonry section, the earth embankment sections might be barely overtopped.

A test flood of 50% of the PMF test flood was routed through the reservoir both with and without the stop logs in place. Fifty percent of the PMF test flood without stop logs results in a spillway outflow of about 320 CFS and allows about 1.0 feet of freeboard to the top of the masonry dam. With stop logs in place, the spillway outflow is also about 320 CFS, but the water level would be just at the top of the masonry dam with no remaining freeboard.

For both the PMF and 50% PMF test storms, the stop logs being in place has an impact on the overtopping potential. For a PMF test flood, the earth embankments are threatened and for a 50% PMF test storm a non-overtopping condition is increased to imminent overtopping of the masonry sections of the dam.

Since over 50% of the total spillway capacity is provided by the two manually operated sluice gates, the spillway capacity should be considered inadequate and further studies are required.

This analysis indicates that the operation of the dam in regards to the spillway stop logs is important and warrants special attention. Due to the limited capacity of the spillways, the storage characteristics of the impoundment area became significant during storm flow conditions.

In view of this, it would appear prudent to discontinue the use of stop logs across the spillway and maintain as much surcharge storage capacity as possible.

5.5 Dam Failure Analysis

A dam failure analysis using the procedures in the Corps of Engineers "Rule of Thumb Guidance For Estimating Downstream Failure Hydrographs" dated April 1978, was performed for the Ashley Lake Dam. The assumed conditions are as follows:

1. Water level prior to breach is at top of dam elevation.

2. Stream flow at time of breach is test flood outflow from routed PMF test flood.

For an assumed breach equal to 40% of the dam's length computed at half height, the breach length is approximately 124 feet. The resulting dam failure flow, using a water height of 21 feet, is 20,000 CFS.

The first damage area impacted by dam failure flow is directly downstream of the dam. The test flood flow prior to dam breach is 725 CFS resulting in a river stage of about 1.0 feet. The dam failure flow is 20,000 CFS resulting in a river stage of about 10.5 feet. The only development directly downstream of the dam is New Lenox Road which is a secondary gravel surfaced road at this location. Post-failure flow will overtop the roadway by about 10 feet.

The second area impacted by dam failure flow is the Ashley Reservoir Intake Dam located about 12,000 feet downstream of the dam. Prior to dam breach, the test flood flow is 725 CFS. This will overtop the 300 foot long stone masonry intake dam by about 0.6 feet, but is not expected to result in significant damage. The attenuated dam failure flow is 17,700 CFS which will result in overtopping the intake dam by about 4.9 feet. It is possible that the masonry intake dam can withstand this amount of overtopping, however, should it fail, the impoundment is very small and additional flow will not be significant in this analysis. Failure of the intake dam will, of course, result in loss of the water supply capacity of this portion of the Pittsfield water supply. Just downstream of the existing intake dam, there is an old intake dam which has been breached. This breached dam is not significant in either attenuating or increasing the dam failure flow in this analysis.

The third damage area impacted by dam failure flow is the crossing of East New Lenox Road about 23,100 feet downstream of the dam. There are 2 houses adjacent to the culvert crossing, one of which is about 8 feet, and the other about 10 feet, above the stream channel. Prior to dam breach, the test flood flow is 725 CFS which will result in a river stage of about 2.0 feet. The culvert has a capacity of about 2450 CFS as open channel flow without any surcharge, therefore, the flow is adequately conveyed through the culvert. The dam failure attenuated flow is 14,200 CFS which will exceed the surcharged capacity of the culvert and overflow the roadway by about 4.0 feet. This will result in a river stage of about 12 feet at the crossing and flood the 2

houses; one by about 4 feet and the other by about 2 feet. This will have the potential for severe damage to both houses and the roadway crossing.

The fourth damage area impacted by dam failure flow is a house located adjacent to the stream channel about 23,900 feet downstream of the dam. The house is about 3 feet above the stream channel. Prior to dam breach, the test flood flow is 725 CFS and results in a river stage of less than 1.0 feet. The dam failure attenuated flow is 14,200 CFS and results in a river stage of about 5.0 feet. This will flood the house by about 2.0 feet and seriously threaten the structure and its occupants.

The dam failure flow reaches the confluence with the Housatonic River about 26,300 feet downstream of the dam. Between the confluence at the next downstream hazard area there is over 500 acres of floodplain area which will attenuate the dam failure flow to a non-hazardous magnitude. Therefore, no additional houses or development areas are threatened downstream of the confluence.

In summary, the dam failure flow has a high potential for damaging about 3 homes with attendant probable loss of more than a few lives. In addition, 1 primary road and 1 secondary gravel surfaced road have a high potential for damage due to a dam failure.

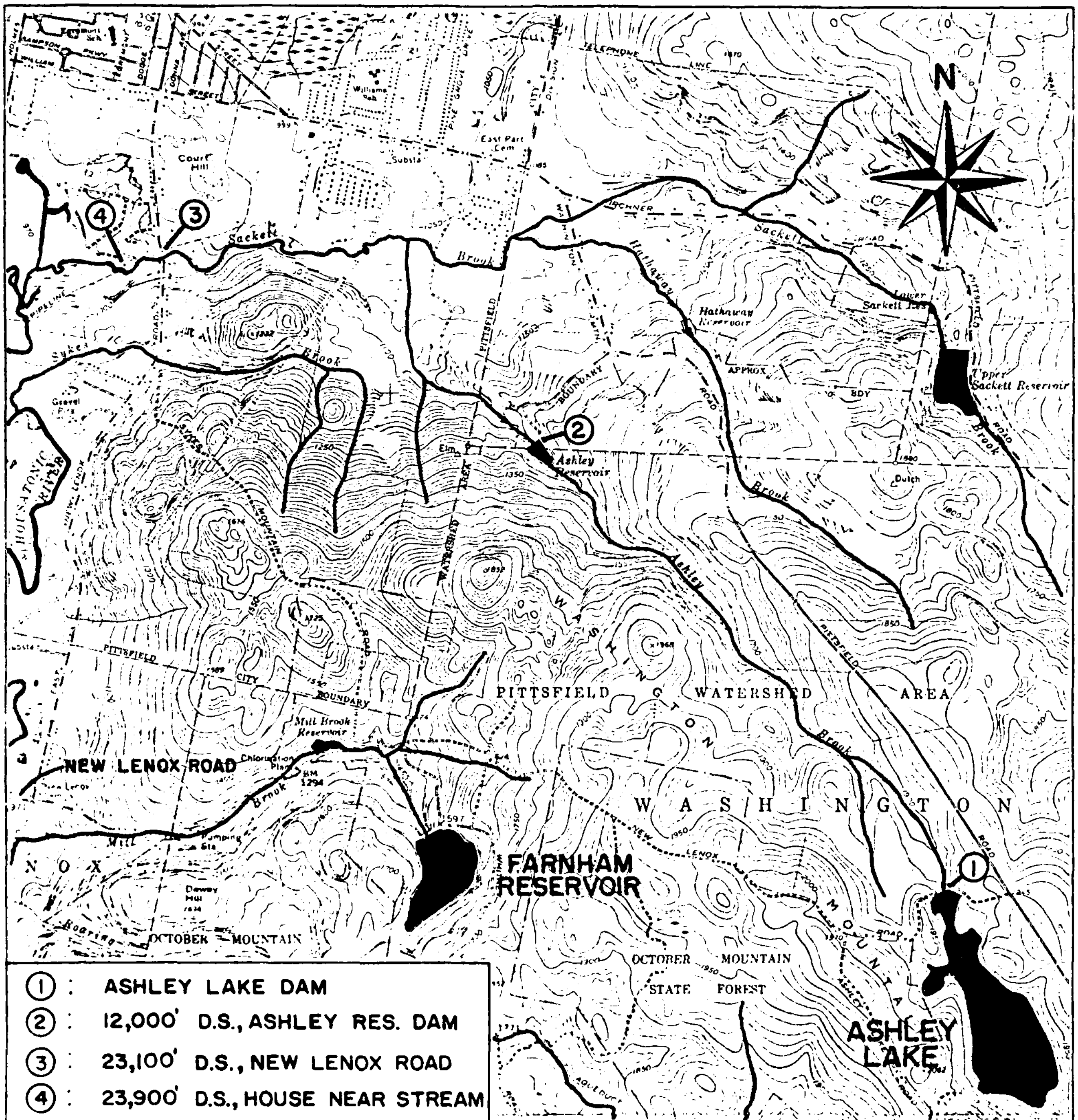
PROBABLE DOWNSTREAM IMPACT BEFORE AND AFTER DAM FAILURE

Ashley Lake Dam MA 00313

	Location	No. of Houses	Other Damage	Flow Rates		River Stage		Comment
				Before Failure	After Failure	Before Failure	After Failure	
1.	Downstream of Dam	0	Culvert	725	20,000	1.0	10.5	Minor Flooding of roadway before failure: after failure road flooded 10 ft.
2.	12.000' D.S. at Intake Dam	0	Possible Loss of water supply intake dam	725	17,700	N/A	N/A	Before failure dam overtopped 0.6 ft.: after failure dam overtopped 4.9 ft. with possible loss of dam.
3.	23,100' D.S. East New Lenox Rd.	2	Culvert	725	14,200	2.0	12.0	Before failure no damage: after failure 1 house flooded 4 ft., 1 house flooded 2 ft., road overtopped 4 ft.
4.	23,900' D.S.	1	---	725	14,200	1.0	5.0	Before failure no damage: after failure 1 house flooded 2 ft.

No. of houses flooded before failure = 0

No. of houses flooded after failure = 3



-SCALE-

1000' 0 1000' 2000' 3000' 4000' 5000'

FROM: U.S.G.S. PITTSFIELD EAST, MASS. QUADRANGLE MAP

QUADRANGLE LOCATION

TIGHE & BOND / SCI
CONSULTING ENGINEERS
EASTHAMPTON, MASS.

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND DOWNSTREAM HAZARD MAP

ASHLEY LAKE DAM (MA00313)
BERKSHIRE COUNTY

WASHINGTON
MASSACHUSETTS

SCALE: AS NOTED

DATE: FEBRUARY 1980

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

A number of deficiencies were noted during our inspection which may affect the structural stability of Ashley Lake Dam including the missing stone in the masonry section, the apparent lateral movement of the masonry section, the numerous leaks in the masonry section, the extensive spalling of concrete on the upstream face of the masonry section and the numerous soft, wet areas on the downstream side of the dam.

Since this is a high lazard dam, seepage and stability analyses comparable to the requirements of paragraph 4.4 of the "Recommended Guidelines for Safety Inspection of Dams" should be carried out.

6.2 Design and Construction Data

The plan listed in Appendix B of this report are the only available data for the Ashley Lake Dam. Although these plans were helpful during the inspection of the facility, they do not provide sufficient information to determine the structural stability of the earth embankment or stone masonry sections of the dam.

6.3 Post Construction Changes

There have been no reported modifications since the dam was built in 1901.

6.4 Seismic Stability

The Ashley Lake Dam is located in seismic zone 1. According to the recommended Corps of Engineers guidelines, a seismic analysis is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

(a) Condition

The dam and its appurtenances are generally in POOR condition at the present time.

(b) Adequacy of Information

There is insufficient design and construction data to permit a complete assessment of dam safety.

(c) Urgency

The recommendations and remedial measures described herein should be implemented by the owner within one year of receipt of this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the following studies or actions be conducted under the supervision of a qualified, registered professional engineer:

1. Seepage and stability analyses of the dam, meeting the requirements of Section 4.4 of the "Recommended Guidelines for Safety Inspection of Dams" should be carried out. The following items should be considered as part of these analyses:

    a. The cause of the numerous leaks in the stone masonry section should be investigated. Repair of the spalling concrete on the upstream face of the stone masonry section may be required.

    b. The cause or causes of the wet areas noted at the downstream toe of the right earth embankment and the soft and wet areas downstream of the stone masonry section should be investigated.

    c. The apparent lateral movement of the stone masonry section approximately 50 feet left of the spillway as well as the cause of the missing stone from the masonry section should be investigated.

2. Further hydraulic and hydrologic studies should be carried out to determine the adequacy of spillway capacity.

3. Remove all trees and stumps from the upstream and downstream faces of the earth embankments and maintain these areas clear of trees within 30 feet horizontally from the toe of the dam.

All holes as a result of tree stump removal should be backfilled with suitable material.

7.3 Remedial Measures

(a) Operation and Maintenance Procedures

It is recommended that the owner institute the following remedial measures:

1) Establish a regular maintenance program for the Ashley Lake Dam.

2) Trim all long grass, brush and weeds on the upstream and downstream faces of the embankment sections and maintain these areas trimmed.

3) Backfill all animal holes with suitable material.

4) Remove all debris from the downstream channel and repair the stone training wall along this channel.

5) Develop and implement a formal, written downstream emergency flood warning system.

6) Develop and implement a program of complete annual technical inspections.

7.4 Alternatives

There are no meaningful alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

ROJECT Ashley Lake Dam (MA 00313)
Washington, Massachusetts

DATE Nov. 7, 1979

TIME 12:00 Noon

WEATHER Cloudy & mild

W.S. ELEV.______U.S.______DN.S.

ARTY:

. J.W. Powers, P.E., Project Manager
. G.H. McDonnell, P.E., Hydrology/ Hydraulics
. E.A. Moe, P.E., Soils/Hydraulics
. D.M. Lenart, P.E., Civil
. H.A. Koski, Civil

6. ______
7. ______
8. ______
9. ______
10. ______

PROJECT FEATURE	INSPECTED BY	REMARKS
1. All project features were inspected by all party members		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
0.		

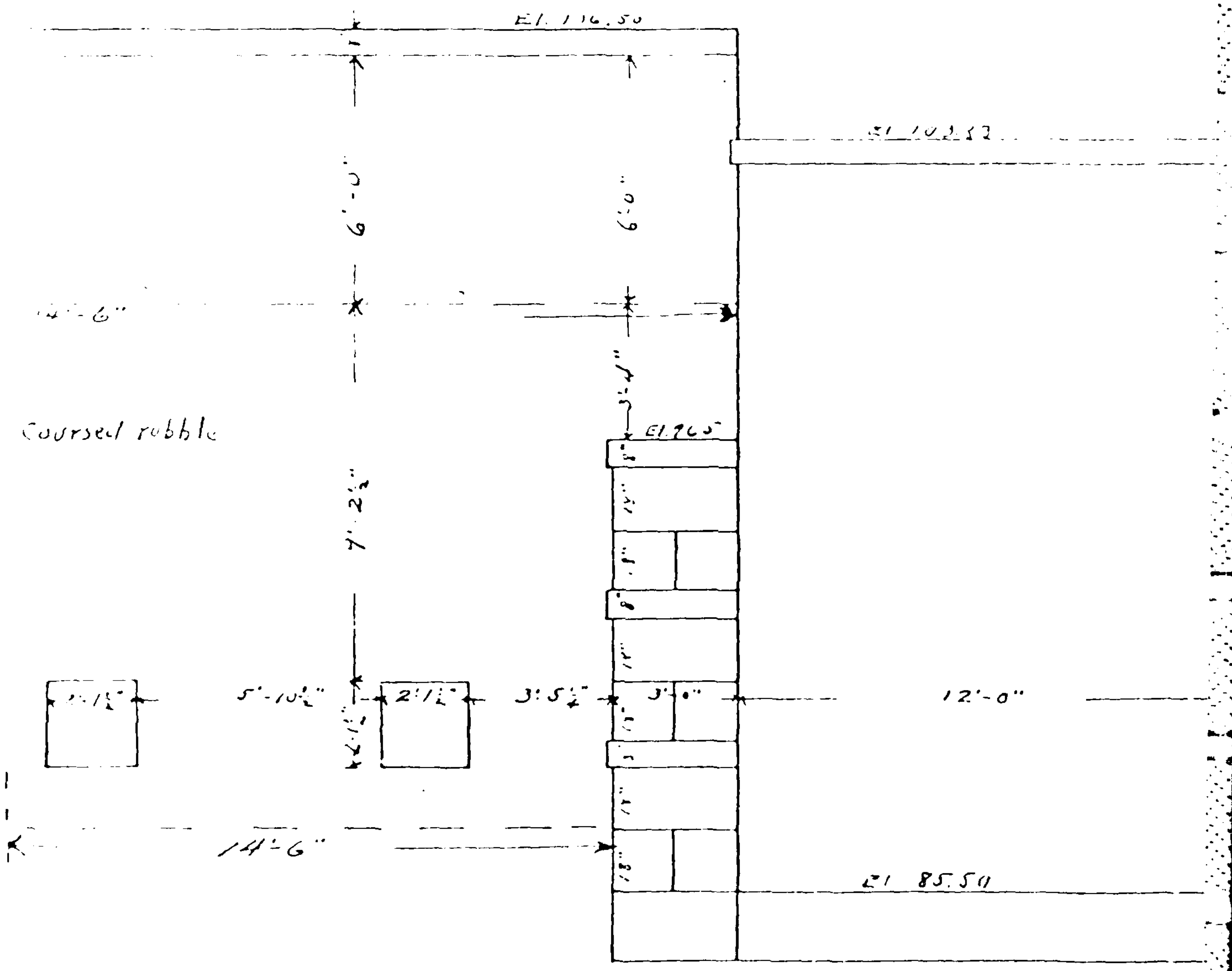
Also present:
R. Pulver - City of Pittsfield Water Department

INSPECTION CHECK LIST

PROJECT ______	DATE ______
PROJECT FEATURE ______	NAME ______
DISCIPLINE ______	NAME ______

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	See Plans
Current Pool Elevation	0.1 feet below spillway crest (not on MSL)
Maximum Impoundment to Date	Unknown
Surface Cracks	Spalling along entire upstream face
Pavement Condition	No pavement
Movement or Settlement of Crest	None apparent
Lateral Movement	Possible movement approximately 50 ft. to left of spillway
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Some spalling, weeds & brush growing between stones in downstream face of dam Two trees growing near left abutment of rock dam
Indications of Movement of Structural Items on Slopes	Back side of dam very wet Poor material, very spongy
Trespassing on Slopes	Not apparent
Vegitation on Slopes	High grass, woods, brush & trees
Sloughing or Erosion of Slopes or Abutments	Some erosion around leaks
Rock Slope Protection - Riprap Failures	None apparent
Unusual Movement or Cracking at or near Toes	Very wet and spongy
Unusual Embankment or Downstream Seepage	Very wet at leaks, material below the dam is not granular
Piping or Boils	None apparent
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

REPRODUCED AT GOVERNMENT EXPENSE



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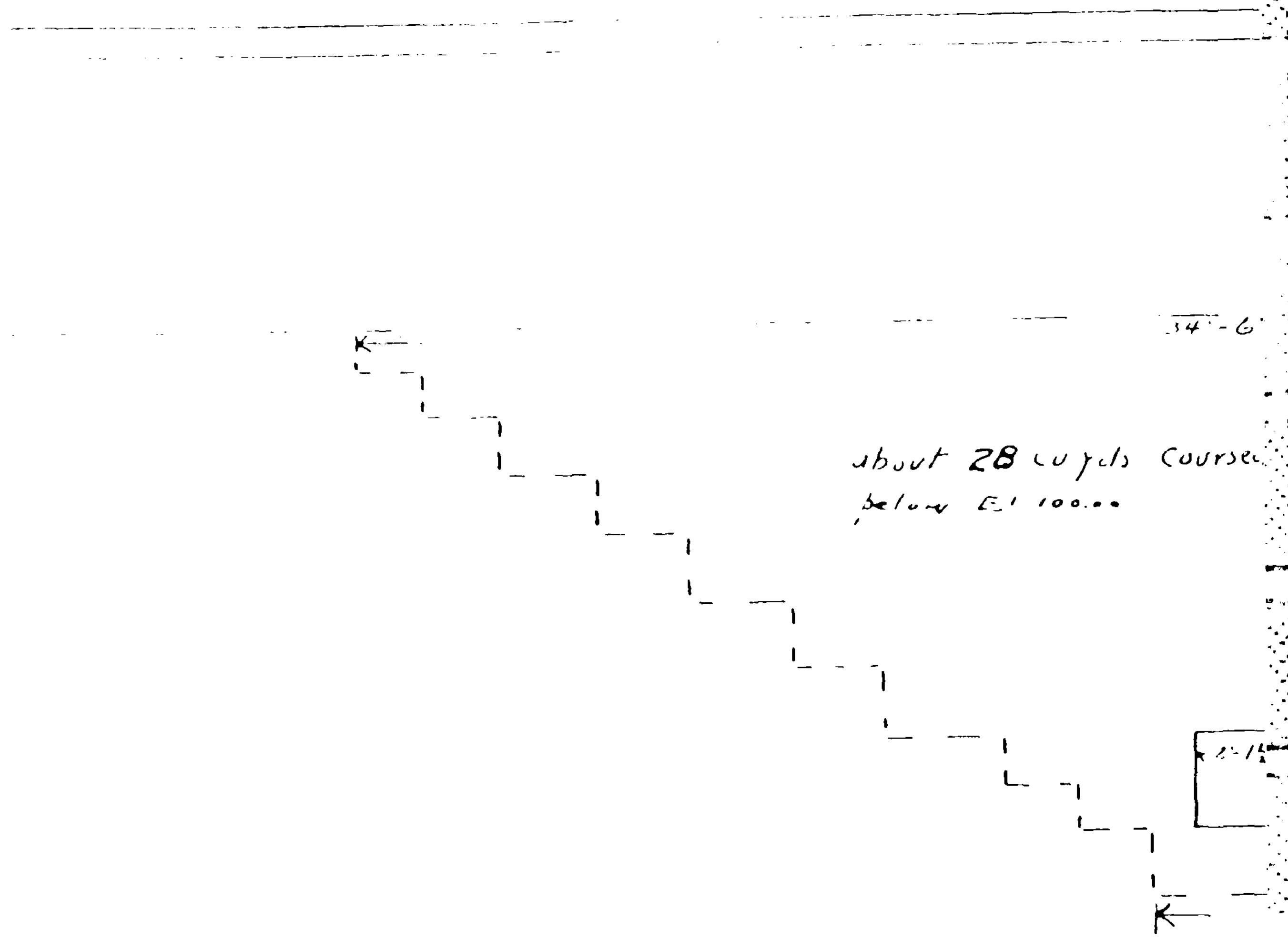
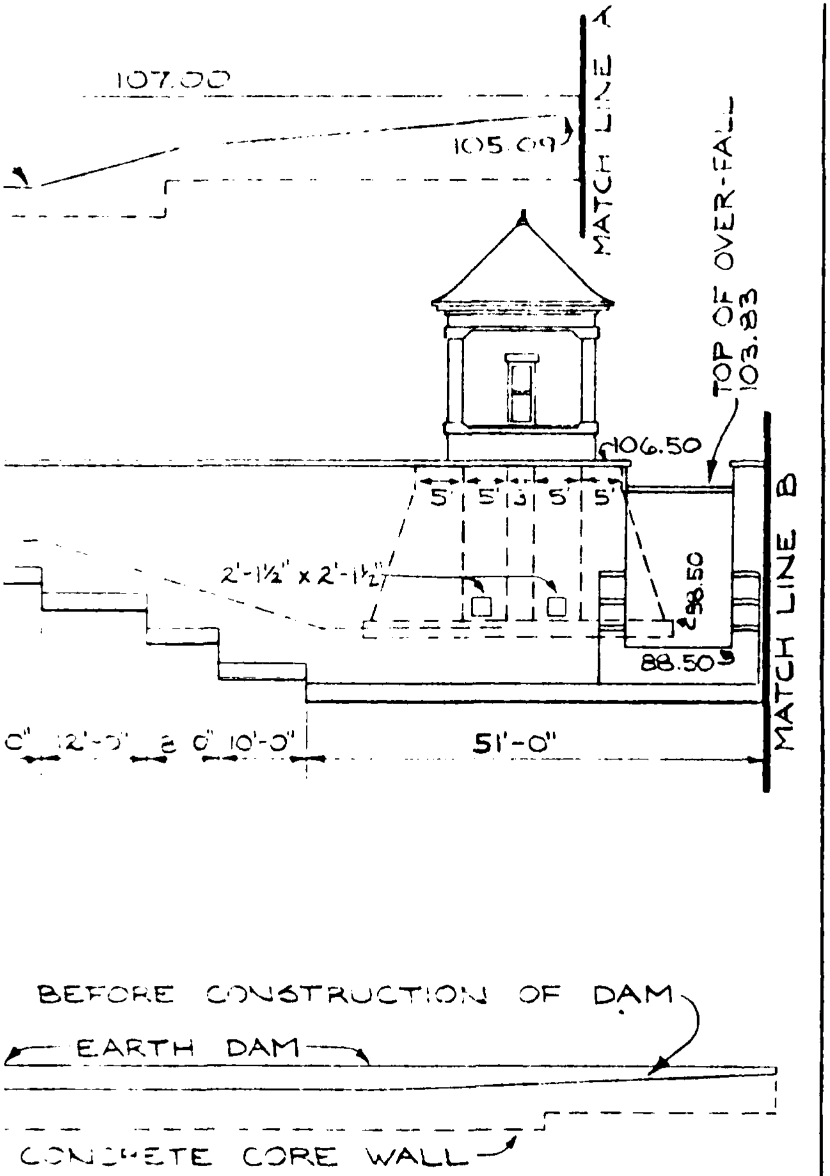


Detail of Coursed Rubble
around outlets from Gate House
ASHLEY LAKE DAM
Scale ¼" = 1' Sept 25th 1901

REPRODUCED AT GOVERNMENT EXPENSE



TIGHE & BOND / SCI CONSULTING ENGINEERS EASTHAMPTON, MASS.	U.S ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

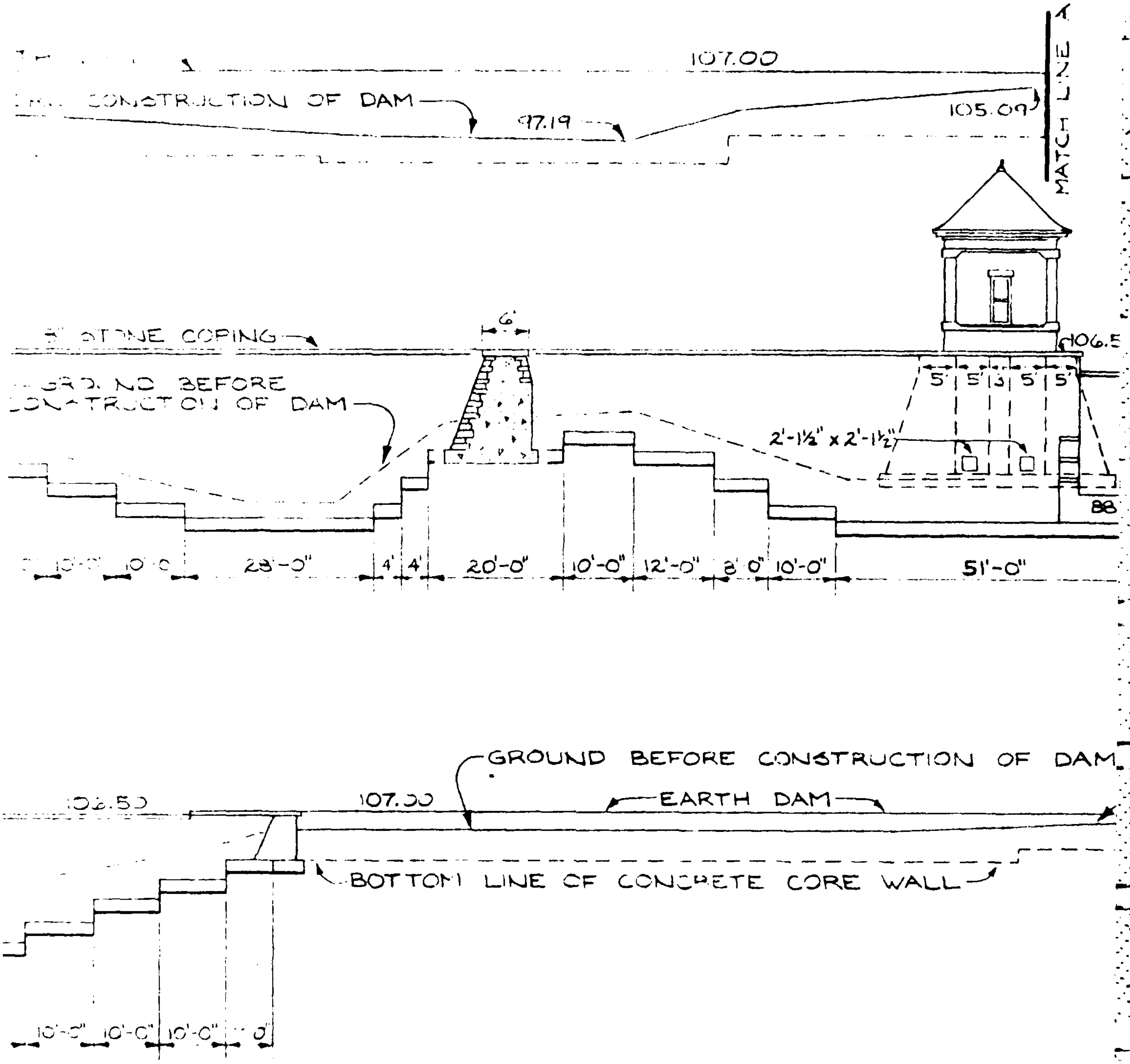
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

ELEVATION OF ASHLEY LAKE DAM

(FROM PLAN BY E.A. ELLSWORTH ENGINEERS, HOLYOKE, MASS.)

			SCALE: NTS
			DATE: FEBRUARY 1980

REPRODUCED AT GOVERNMENT EXPENSE



TIGHE & BOND / SCI CONSULTING ENGINEERS EASTHAMPTON, MASS.	U.S. ARMY ENGINEER DIV. CORPS OF ENGI WALTHAM, MAS

NATIONAL PROGRAM OF INSPECTION OF NON-

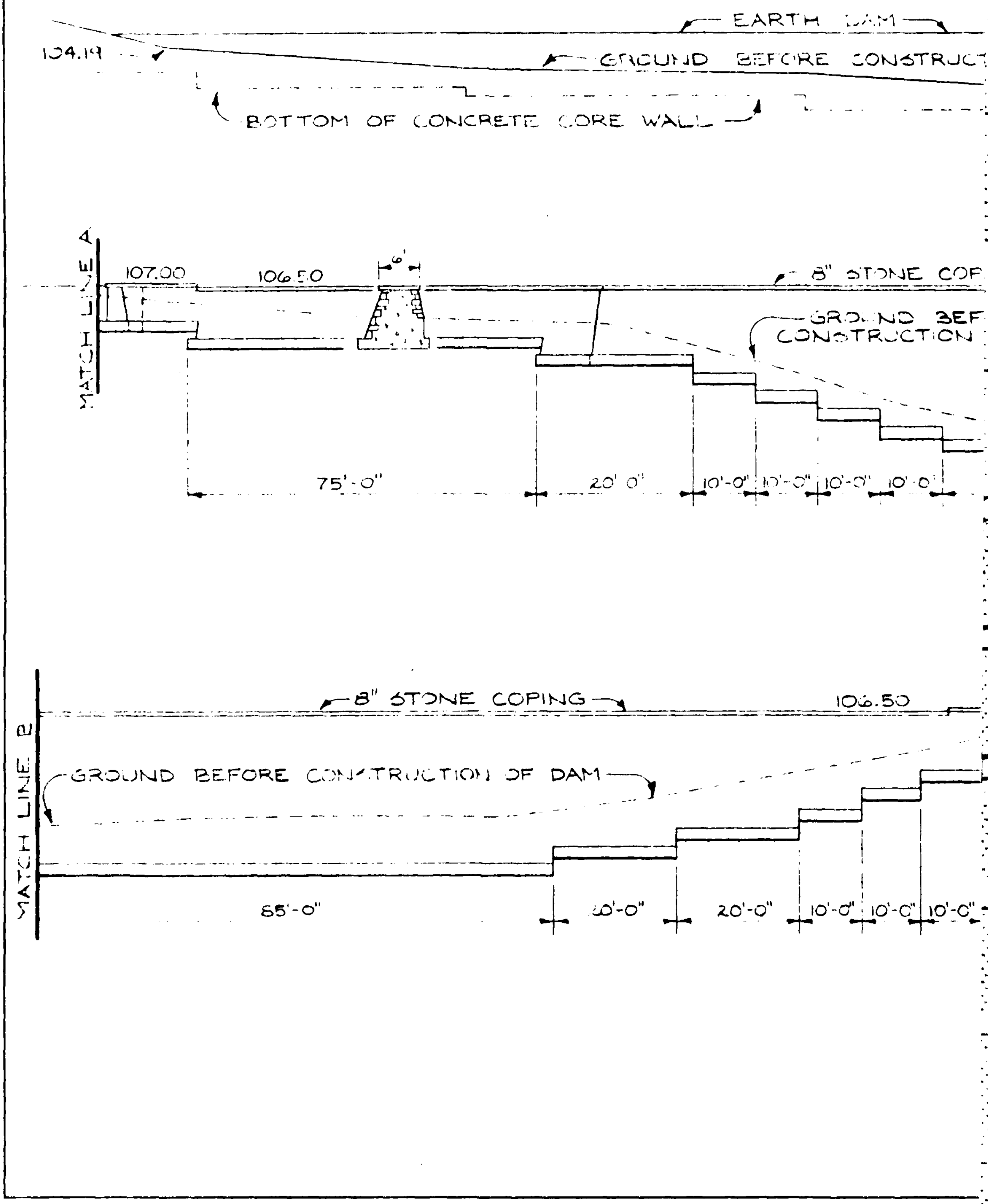
ELEVATION OF ASHLEY LAKE

(FROM PLAN BY E.A. ELLSWOR
ENGINEERS, HOLYOKE, MASS

SCALE: N.T.S

DATE: FEBRUARY 1980

REPRODUCED AT GOVERNMENT EXPENSE



1 of 3

APPENDIX B

The following plans are available at the City of Pittsfield Water Department offices:

1. Location Plan

2. Plan and elevations with section of proposed dam ("Elevation of Ashley Lake Dam," taken from this plan, is included herein.)

3. Detail plan for gatehouse

4. Details of gatehouse substructure

5. Detail of coursed rubble around outlets from gatehouse (copy included herein)

6. Spillway granite walls

7. Stone coping plan

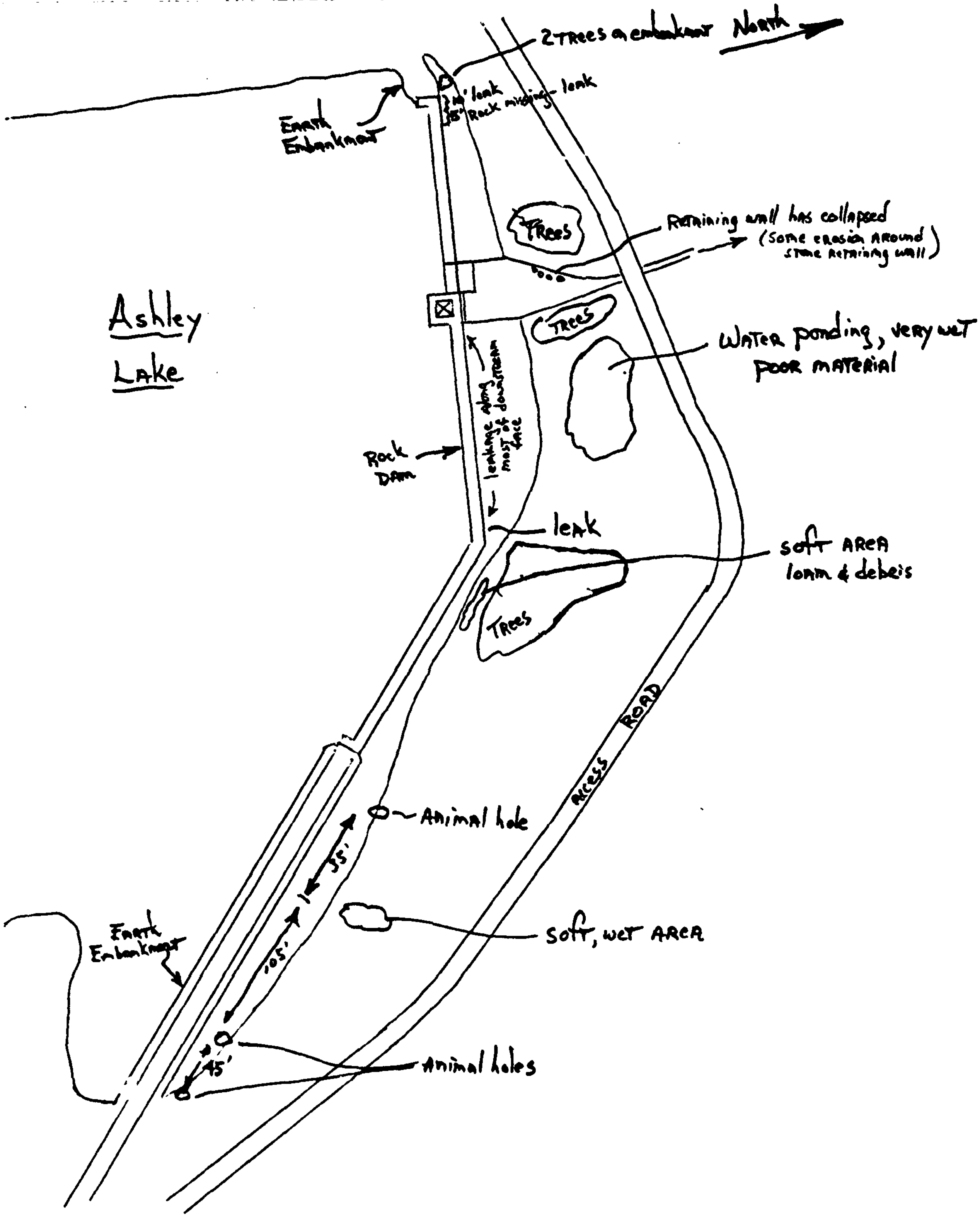
8. Overflow spillway detail

9. Ashley Lake bottom contours

No. 5 was the only document available for reproduction and of such size and/or quality as to allow insertion in this report.

APPENDIX B

ENGINEERING DATA



Sketch of The Ashley Lake Dam
Washington, MASS.

INSPECTION CHECK LIST

PROJECT ____________________ DATE ____________________

PROJECT FEATURE ____________________ NAME ____________________

DISCIPLINE ____________________ NAME ____________________

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	NONE
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

INSPECTION CHECK LIST

PROJECT ____________________ DATE ____________________

PROJECT FEATURE ____________________ NAME ____________________

DISCIPLINE ____________________ NAME ____________________

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Stone approach in good condition
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Stone
b. Weir and Training Walls	
General Condition of Concrete	Stone walls in good condition
Rust or Staining	None
Spalling	Not applicable
Any Visible Reinforcing	Not applicable
Any Seepage or Efflorescence	None apparent
Drain Holes	None apparent
c. Discharge Channel	
General Condition	The channel is in poor condition
Loose Rock Overhanging Channel	Stone retaining wall collapsed into channel
Trees Overhanging Channel	Trees growing along channel
Floor of Channel	Loose stone 4" to 6" diameter
Other Obstructions	Weeds and debris 48" diameter boiler plate culvert at downstream crossing of access road

INSPECTION CHECK LIST

PROJECT ______________________ DATE ______________________

PROJECT FEATURE ______________________ NAME ______________________

DISCIPLINE ______________________ NAME ______________________

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Not Applicable
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

INSPECTION CHECK LIST

PROJECT ____________ DATE ____________

PROJECT FEATURE ____________ NAME ____________

DISCIPLINE ____________ NAME ____________

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	There are two 2' 1¼" square stone channels which discharge water from the lake during normal operation. However, there was no access to these channels and our inspection was based on observations made from what could be seen from the downstream retaining wall.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

INSPECTION CHECK LIST

PROJECT ______________________ DATE ______________________

PROJECT FEATURE ______________________ NAME ______________________

DISCIPLINE ______________________ NAME ______________________

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	GATE HOUSE
a. Concrete and Structural	
General Condition	The 16'x16' brick gate house is in good condition
Condition of Joints	Fair
Spalling	Spalling along upstream face of dam
Visible Reinforcing	Not applicable
Rusting or Staining of Concrete	Not applicable
Any Seepage or Efflorescence	No
Joint Alignment	Good
Unusual Seepage or Leaks in Gate Chamber	None apparent
Cracks	None
Rusting or Corrosion of Steel	Not applicable
b. Mechanical and Electrical	
Air Vents	None
Float Wells	None
Crane Hoist	6"x8" beam with pulley to raise or lower wooden gates
Elevator	None
Hydraulic System	None
Service Gates	2-2' 1¼" sluice gates
Emergency Gates	2-3' 8" x 4' 10" slide gates
Lightning Protection System	None
Emergency Power System	None
Wiring and Lighting System in Gate Chamber	None

INSPECTION CHECK LIST

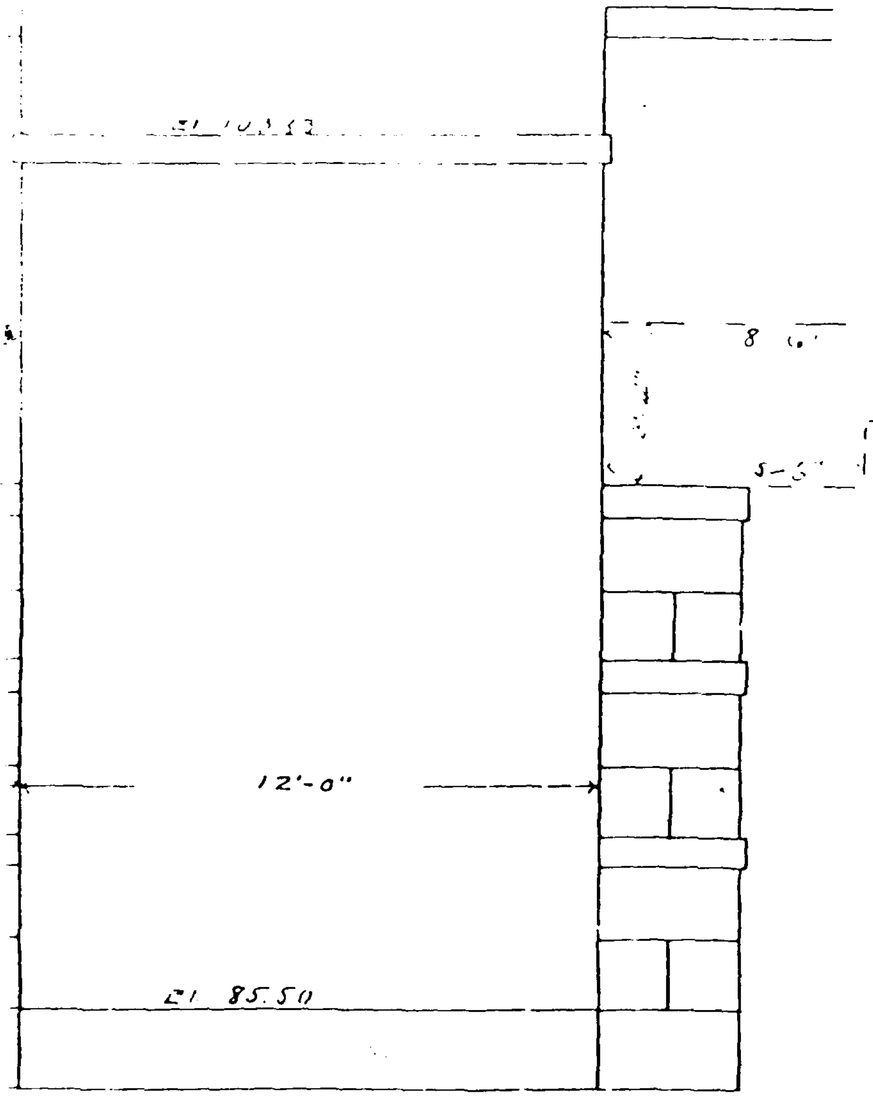
PROJECT __________ DATE __________

PROJECT FEATURE __________ NAME __________

DISCIPLINE __________ NAME __________

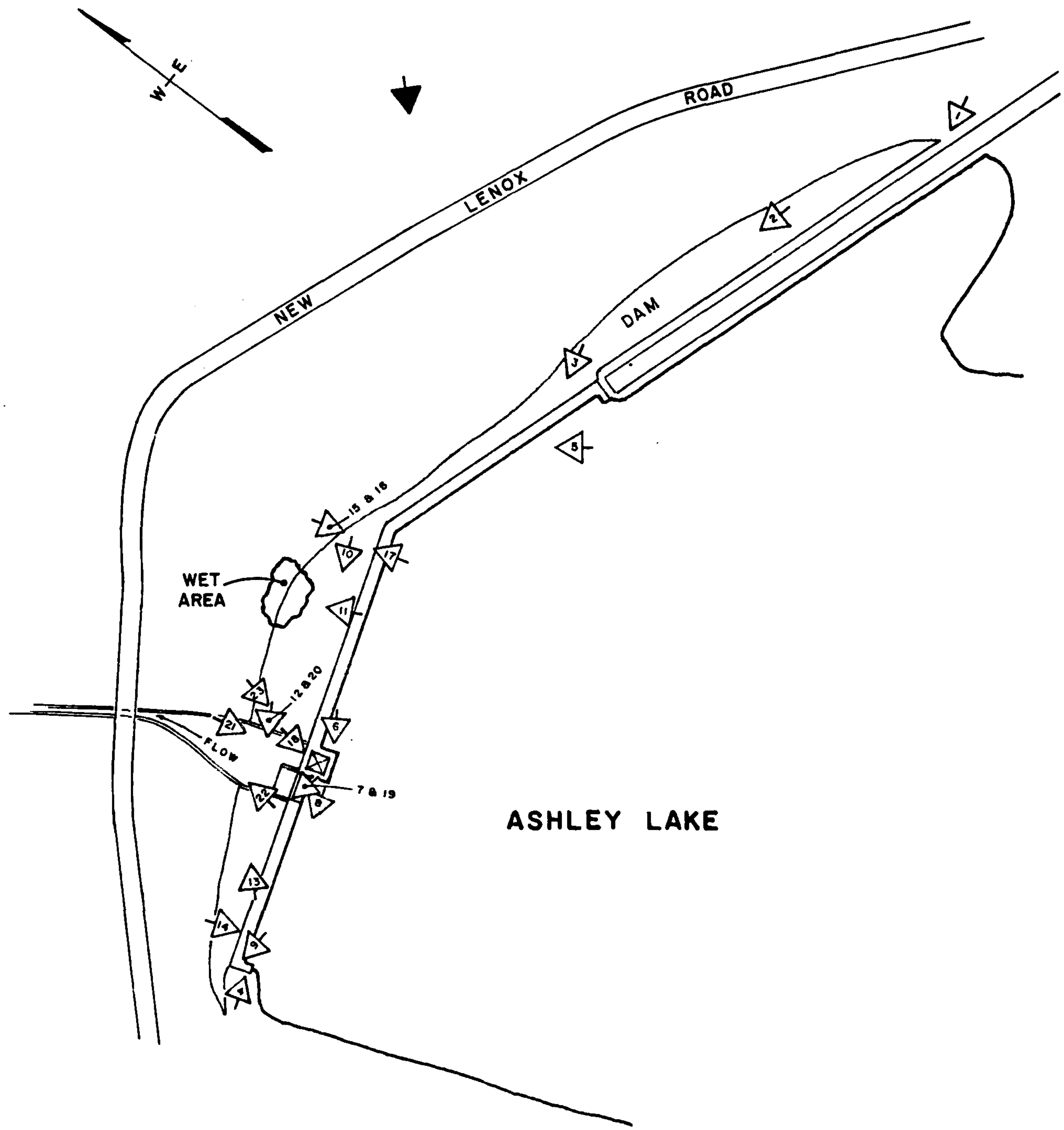
AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	Not Applicable
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

REPRODUCED AT GOVERNMENT EXPENSE



APPENDIX C

PHOTOGRAPHS



OVERVIEW (AERIAL)

APPENDIX C

TIGHE & BOND / SCI CONSULTING ENGINEERS EASTHAMPTON, MASS.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND ORIENTATION OF PHOTOS

ASHLEY LAKE DAM (MA 00313) WASHINGTON
BERKSHIRE COUNTY MASSACHUSETTS

SCALE: NONE

DATE: FEBRUARY 1980

REPRODUCED AT GOVERNMENT EXPENSE

Photo 1 - Dam overview looking northwesterly from right abutment.

Photo 2 - Dam overview looking northerly from right abutment.

Photo 3 - Dam overview looking westerly from right embankment.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 4 - Dam overview looking easterly from left abutment.

Photo 5 - Upstream face of dam looking easterly.

Photo 6 - Upstream face of dam looking westerly at base of gate house.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 7 - Looking northerly at upstream face of dam left of spillway.

Photo 8 - Upstream face of dam looking westerly from gate house.

Photo 9 - Looking northerly at left abutment of stone dam.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 10 - Downstream face of dam looking westerly from bend.

Photo 11 - Wet area at toe of slope looking northerly from dam.

REPRODUCED AT GOVERNMENT EXPENSE

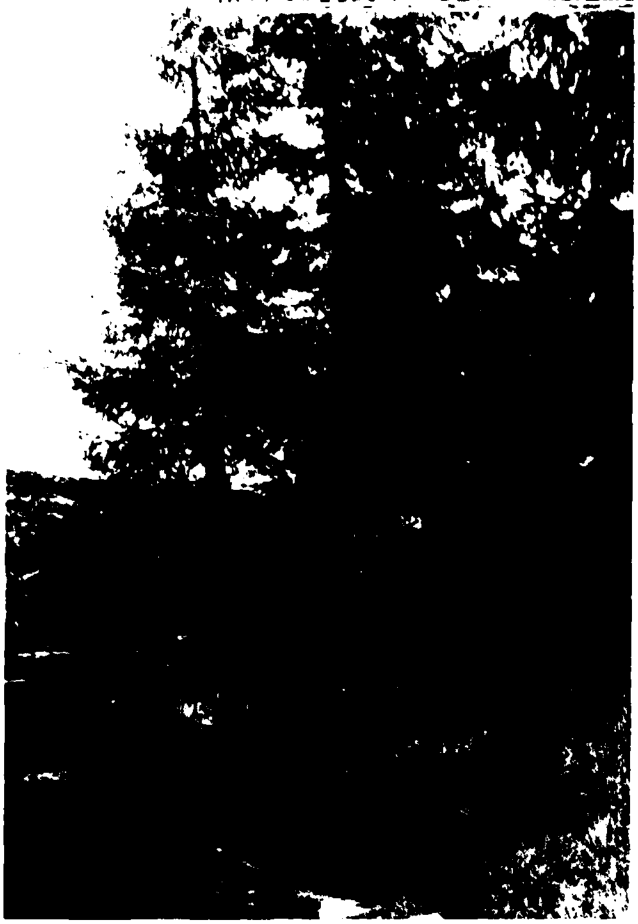


Photo 12 - Trees left of spillway looking southerly from discharge channel.

Photo 13 - Downstream face of dam looking northerly from dam.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 14 - Leakage from stone dam.

Photo 15 - Apparent leakage from stone dam.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 16 - Leakage from stone dam.

Photo 17 - Overview of wet area along base of stone dam.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 18 - Inside of gate house.

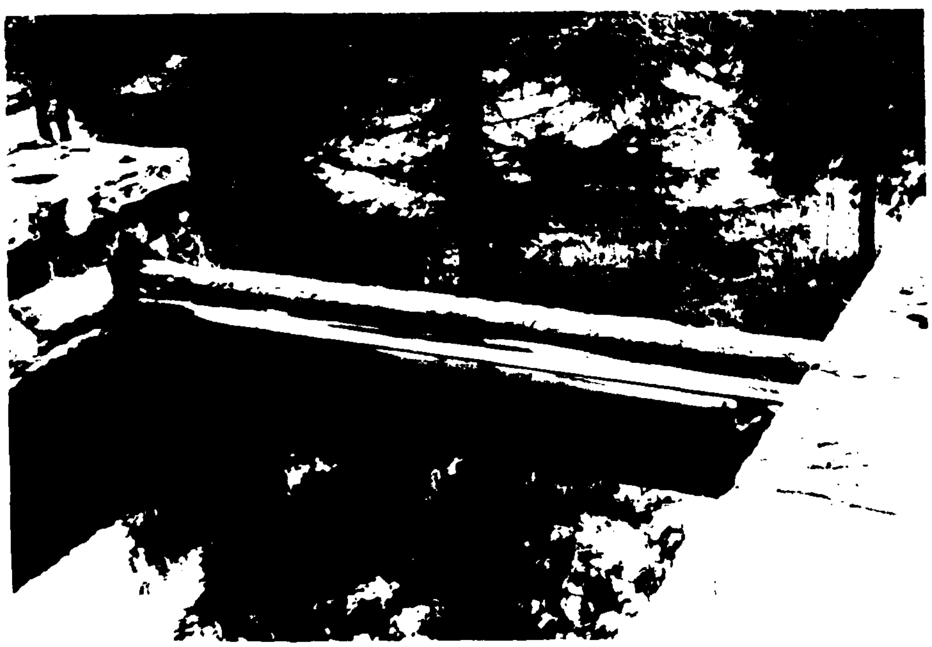


Photo 19 - Spillway and stoplogs looking northerly from gate house.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 20 - Downstream face of spillway.

Photo 21 - Downstream face of dam at gate house outlets.

REPRODUCED AT GOVERNMENT EXPENSE

Photo 22 - Discharge channel looking northerly from gate house.

Photo 23 - Discharge channel just downstream of spillway.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

1) Dam Failure Analysis – Ashley Lake Dam - Washington, Mass.

$$Q = 8/27 \; W_b \sqrt{g} \; y_o^{3/2}$$

where,

W_b = Breach Width (40% of dam length @ Mid height)

Y_o = Total height from River Bed to Pool Level at failure.

Q_{P_1} = Peak Failure Outflow

$g = 32.2$ ft/sec.

$W_b = 310 \text{ ft} \times 40\% = 124$ feet

$Y_o = 21$ feet (Assume that water will be at top of dam when failure occurs.)

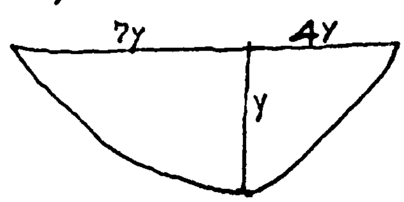
$$Q_{P_1} = 8/27 \times 124 \times \sqrt{32.2} \times 21^{3/2}$$

$$= 8/27 \times 124 \times 5.675 \times 96.23$$

Q_{P_1} = 20,064 c.f.s. use 20,000 cfs

2) Compute effect at First Section - Ashley Reservoir Dam which is approximately 12,000 feet downstream of the Ashley Lake Dam. Section taken just upstream of the Reservoir

Reach = 12,000 ft



$$\text{Area} = \frac{7y^2}{2} + \frac{4y^2}{2} = \frac{11y^2}{2} = 5.5y^2 \quad W.P. \approx 11.1y$$

$$S = \frac{1906-1250}{12,500} = \frac{656}{12,500} = 0.05 \qquad R = \frac{A}{W.P} = \frac{5.5y^2}{11.1y} = 0.495y$$

$n = 0.03$

Ⓑ 1/2 PMF (800 cfs)

@ Elev. 1925 : $Stor = \frac{112+116}{2} \times 1 = 114$ ac. ft

$Runoff = \frac{114}{410} = 3.3$ in

$Q_{P2} = 800\left(1-\frac{3.3}{9.5}\right) = 522$ cfs

@ Elev. 1926 : $Stor = \frac{112+118}{2} \times 2 = 230$ ac. ft

$Runoff = \frac{230}{410} = 6.7$ in

$Q_{P3} = 800\left(1-\frac{6.7}{9.5}\right) = 235$ cfs

@ Elev. 1926.7 : $Stor = \frac{112+122}{2} \times 2.7 = 299$ ac. ft

$Runoff = \frac{299}{410} = 8.56$ in

$Q_{P4} = 800\left(1-\frac{8.56}{9.5}\right) = 79$ CFS

See graph on page 8 for match point with elev. vs. discharge curve.

Reservoir Stage = 1925.7

∴ 1.0 ft freeboard remaing to top of dam.

Ⓒ Full PMF WITH STOP LOGS

See graph page 8 : stage = 1927.3

Masonry Dam overtopped 0.6± ft

Ⓓ 1/2 PMF WITH STOP LOGS

See graph page 8 : stage = 1926.7 (top of dam)

Freeboard remaining = 0 ft

Test Flood Routing

(A) Full PMF

1) stop logs removed
2) at begining of storm pond elev. @ 1924
3) See page 1 for Pond elev. vs. surface area.

@ Elev. 1926:

$$Stor = \frac{112+118}{2} \times 2 = 230 \text{ ac.ft.}$$

$$Runoff = \frac{230}{410} = 6.7 \text{ in}$$

$$Q_{p2} = 1600\left(1-\frac{6.7}{19}\right) = 1035 \text{ cfs.}$$

@ Elev. 1927:

$$Stor = \frac{112+123}{2} \times 3 = 352 \text{ ac.ft.}$$

$$Runoff = \frac{352}{410} = 10.3 \text{ in}$$

$$Q_{p3} = 1600\left(1-\frac{10.3}{19}\right) = 732 \text{ cfs.}$$

@ Elev. 1928:

$$Stor = \frac{112+126}{2} \times 4 = 476 \text{ ac.ft}$$

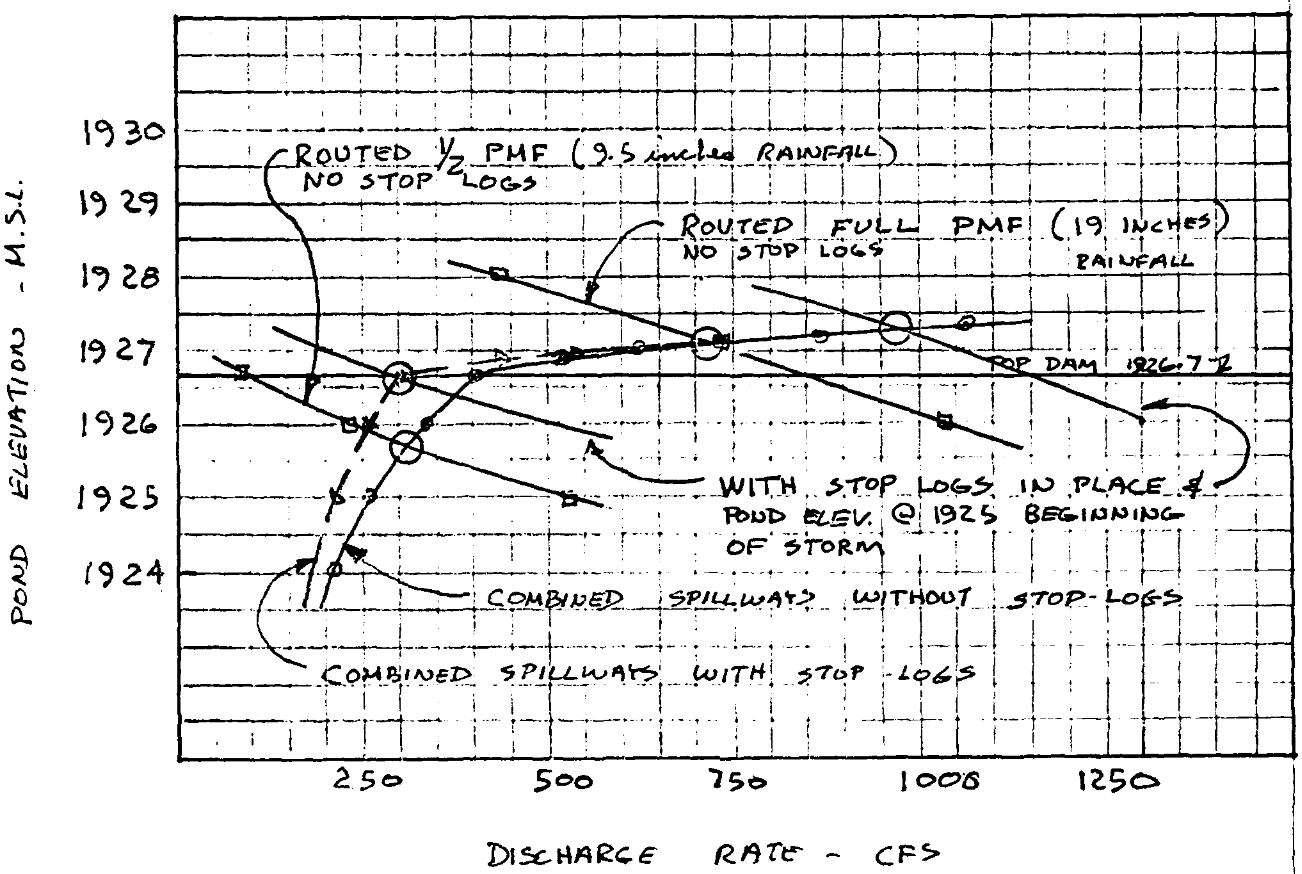
$$Runoff = \frac{476}{410} = 13.9 \text{ in}$$

$$Q_{p3} = 1600\left(1-\frac{13.9}{19}\right) = 429 \text{ CFS}$$

See graph on page 8 for match point with elev vs. discharge curve.

Reservoir stage = 1927.1

∴ Masonry Dam overtopped by 0.4 ft



Spillway Capacity to Top of Dam

(a) No stop-Logs - 403 CFS

(b) With stop-Logs - 320 CFS

Test Flood Routing: (See pages 9 & 10 for comps)

a) Full PMF - No stop logs. : dam overtopped 0.4 ft

b) " " - With stop logs : " " 0.6 ft

c) 1/2 PMF - No stop logs : freeboard = 1.0 ft

D) " " - With stop logs: W.L. @ Top of Dam.

4) Flow over Masonry Dam as Broad Crested Weir:

$$Q = CL(H)^{3/2} \qquad C = 2.6, \quad L = 500 \pm ft$$

$H = 0.2'$ $\quad Q = (2.6)(500(0.2)^{3/2} = 116$ CFS

$H = 0.3'$ $\quad Q = (2.6)(500)(0.3)^{3/2} = 215$ "

$H = 0.5'$ $\quad Q = (2.6)(500)(0.5)^{3/2} = 460$ "

$H = 0.7'$ $\quad Q = (2.6)(500)(0.7)^{3/2} = 760$ "

Total Discharge without Stop Logs:

Elev. M.S.L.	Q.
1924	214 CFS
1925	261 "
1926	339 "
1926.7	403 "
1926.9	519 "
1927.0	618 "
1927.2	863 "
1927.4	1163 "

Total Discharge with Stop Logs:

Elev. M.S.L.	Q.
1924	214 CFS
1925	222 CFS
1926	269 CFS
1926.7	320 CFS
1926.9	433 CFS
1927.0	535 CFS
1927.2	780 CFS
1927.4	1080 CFS

Spillway Rating

Stage - Discharge

1) Rectangular Weir for flow through spillway

$$Q = 3.33\,(L-0.2H)H^{1.5} \quad \text{where } L = 12\text{ ft}$$

Elev (MSL)	Height (in ft.)	Q (in cfs.)
1924	0	0
1925	1	39
1926	2	109
1926.7	2.7	169
1927.7	3.7	267
1927.8	3.8	277
1927.9	3.9	287
1928.2	4.2	320

Without Stop-Logs.

(Stop Logs will increase water elevation by 1.07 ft.)

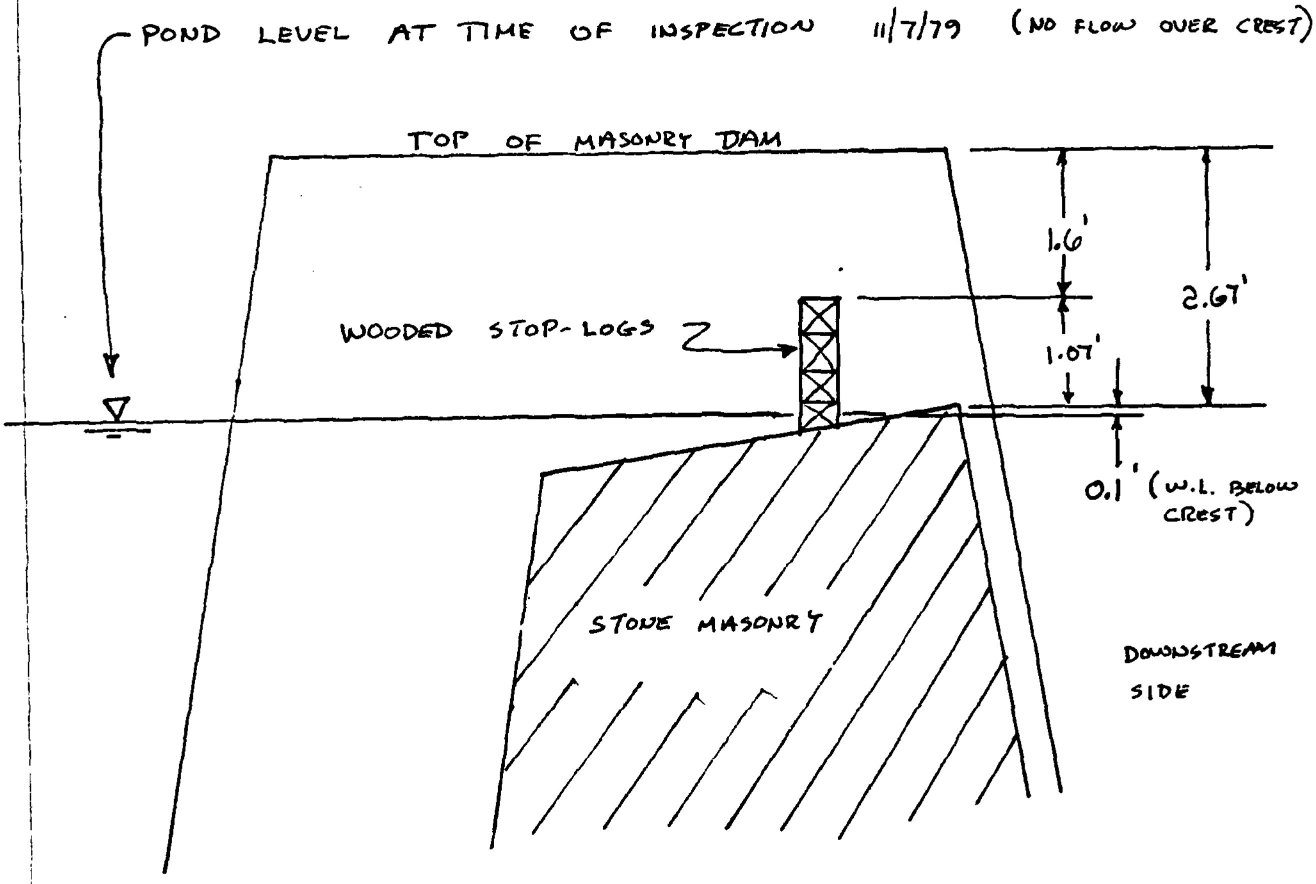
2) Flow through sluice gates 2 - 2'1¼" square openings

25¼" × 25¼" = 637.6 sq. in = 4.4 sq. ft. for each gate

Elev. (MSL)	Head (ft.)	$Q = CA\sqrt{2gH}$ where C = 0.82; (Orifice)			
1924	13.8	107 c.f.s.	× 2	=	214 c.f.s.
1925	14.8	111 c.f.s.	× 2	=	222 c.f.s.
1926	15.8	115 "	× 2	=	230 "
1926.7	16.5	117 "	× 2	=	234 "
1927.7	17.5	121 "	× 2	=	242 "
1927.8	17.6	121.5 "	× 2	=	243 "
1927.9	17.7	122 "	× 2	=	244 "
1928.2	18.0	123 "	× 2	=	246 "

3) Combined Discharge

Elev. (m.s.l.)	Spillway Flow (c.f.s.)	Flow thru both Sluice Gates (cfs)	Total (c.f.s.)
1924	0	214	214
1925	39	222	261
1926	109	230	339
1926.7	169	234	403
1927.7	267	242	509
1927.8	277	243	520
1927.9	287	244	531
1928.2	320	246	566



Section Thru. Spillway

N.T.S.

REVISED BY: OHD

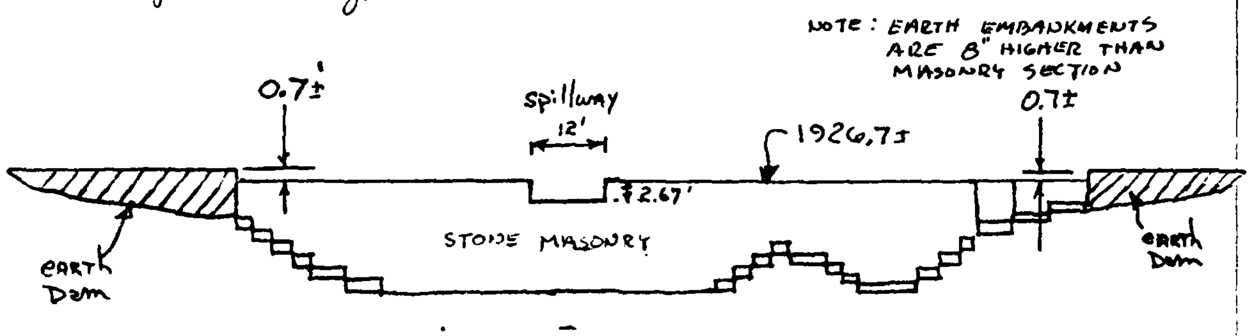
Spillway Rating (cont.)

From curve on page 4. Maximum Probable Flood for D.A. of 0.64 sq. miles = 2,475 c.f.s./sq.mi.

$2{,}475 \times 0.64 = 1{,}584$ c.f.s say $\underline{1{,}600 \text{ c.f.s.}}$

The Ashley Lake Dam is a Rock dam with an earthen dam on each side. The dam is located on the northern end of the lake and is comprised of the dam (21± ft high), center spillway (12 ft wide) and a gate house with 2 - 2'1¼" sluice gates which regulate the release of water to the downstream water supply intake reservoir. The lake supplies impounded storage for the City of Pittsfield Water Supply system.

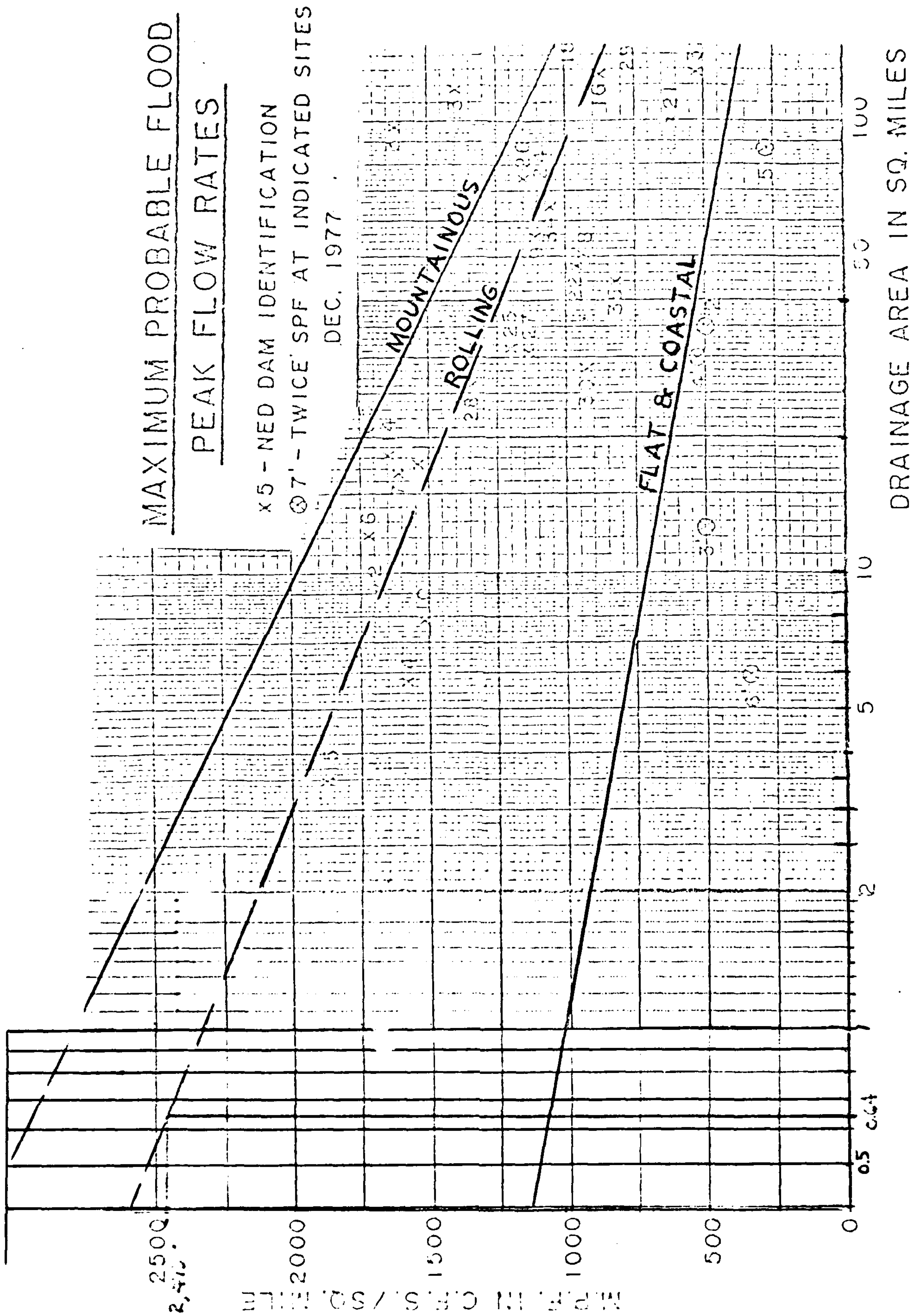
Profile along ℄ Dam:



Assume spillway elevation and normal pool elevation to be 1924 (per U.S.G.S. Quadrangle - Pittsfield, East, Mass.)

∴ Elevation @ Top of Dam = 2.67 + 1924 = 1926.67 say $\underline{1926.7}$

Jan 28, 1980 Ashley Lake Dam checked by: Moe



Revised By: OHD

Size Classification

Height of Dam = 21 ft   < 25' ∴ below Small

Storage = 1,120± Acre-Feet @ normal pool elevation

This is between 1,000 & 50,000 ∴ Intermediate

Classification: Intermediate

Hazard Potential

The hazard potential is High

See text for analysis of downstream damage.

Test Flood

Recommended Spillway Design Flood - 1/2 PMF to PMF

∴ check conditions at both 1/2 & full PMF

Classification of Terrain in Drainage Area

The area is primarily Rolling terrain with a few sections of steep terrain. Rolling terrain will be used in determining the Peak Flow Rates.

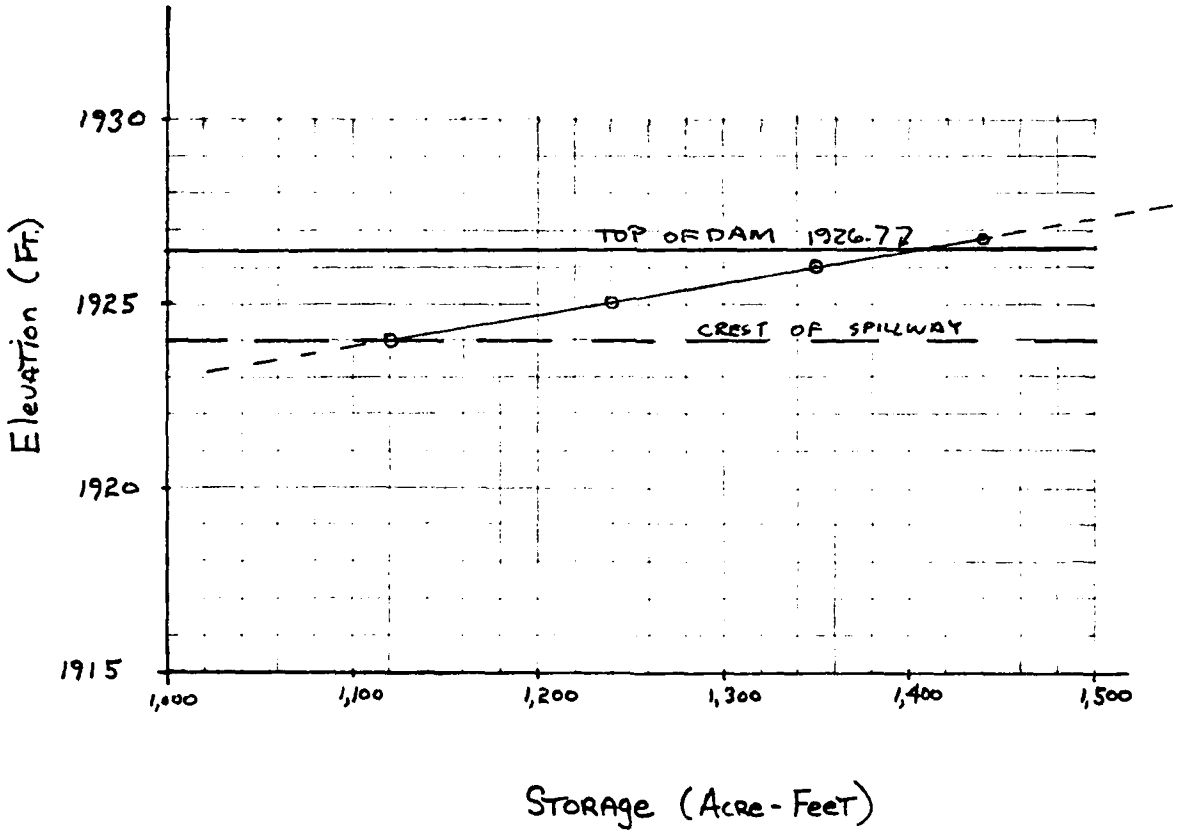
Spillway Rating

1. Use P.M.F.
2. Assume Rolling Terrain
3. Drainage Area = 0.64 square miles
4. Use the "Maximum Probable Flood Peak Flow Rates" curves and extrapolate for a drainage area of 0.64 sq. mi. (See next sheet)

Storage

Assume average depth of Pond = 10 ft. @ 1924

Elev.	Surface Area	Height above Normal Pool Elev.	Storage (Approx.)
1924	112 Acres	—	1,120 Ac.Ft.
1925	116 Acres	1	1,240 Ac.Ft.
1926	118 Acres	2	1,350 Ac.Ft.
1926.7	123 Acres	2.7	1,440 Ac.Ft.



Calculations based on information from U.S.G.S. Map - Pittsfield East, Mass.

Scale 1" = 2000'

1 sq. in = 91.83 Acres or 0.143 sq. miles

Drainage Area

By planimeter = 4.45 sq. in × 91.83 Acres/sq. in = 408.6 say 410 Acres

4.45 sq. in × 0.143 sq mi/sq in = 0.636 say 0.64 sq. mi.

Surface Area of Lake

By planimeter

1. @ Elevation 1924 (Normal Pool Elevation)

1.22 sq. in × 91.83 Acres/sq. in = 112 Acres

1.22 sq. in × 0.143 sq. mi/sq. in = 0.17 sq. miles

2. @ Elevation 1930

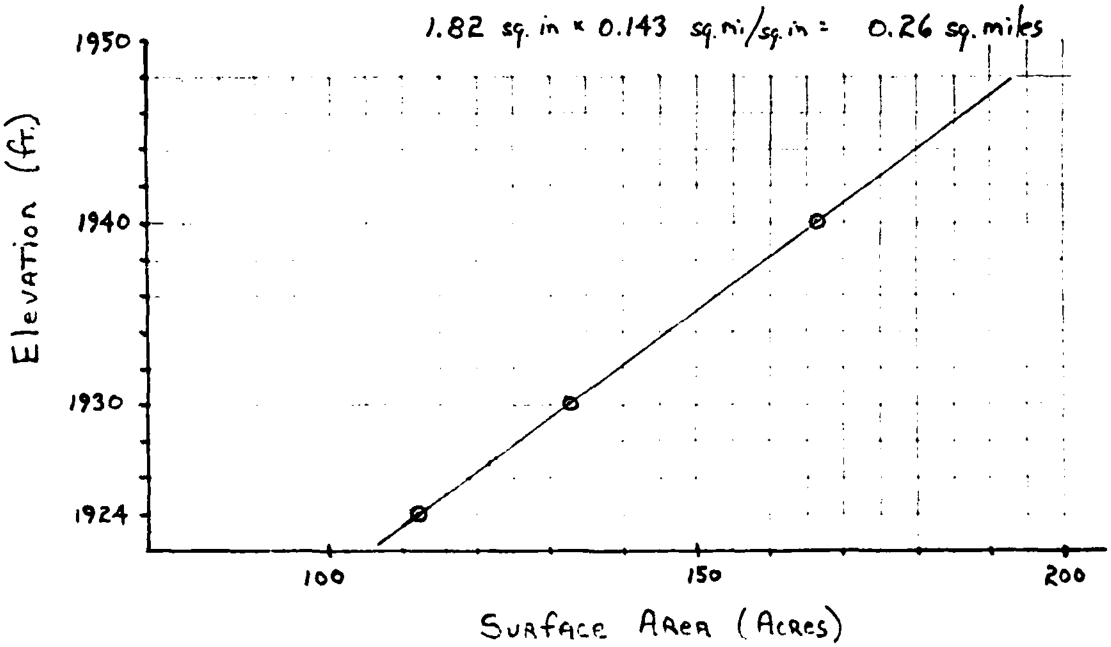
1.45 sq in × 91.83 Acres/sq. in = 133 Acres

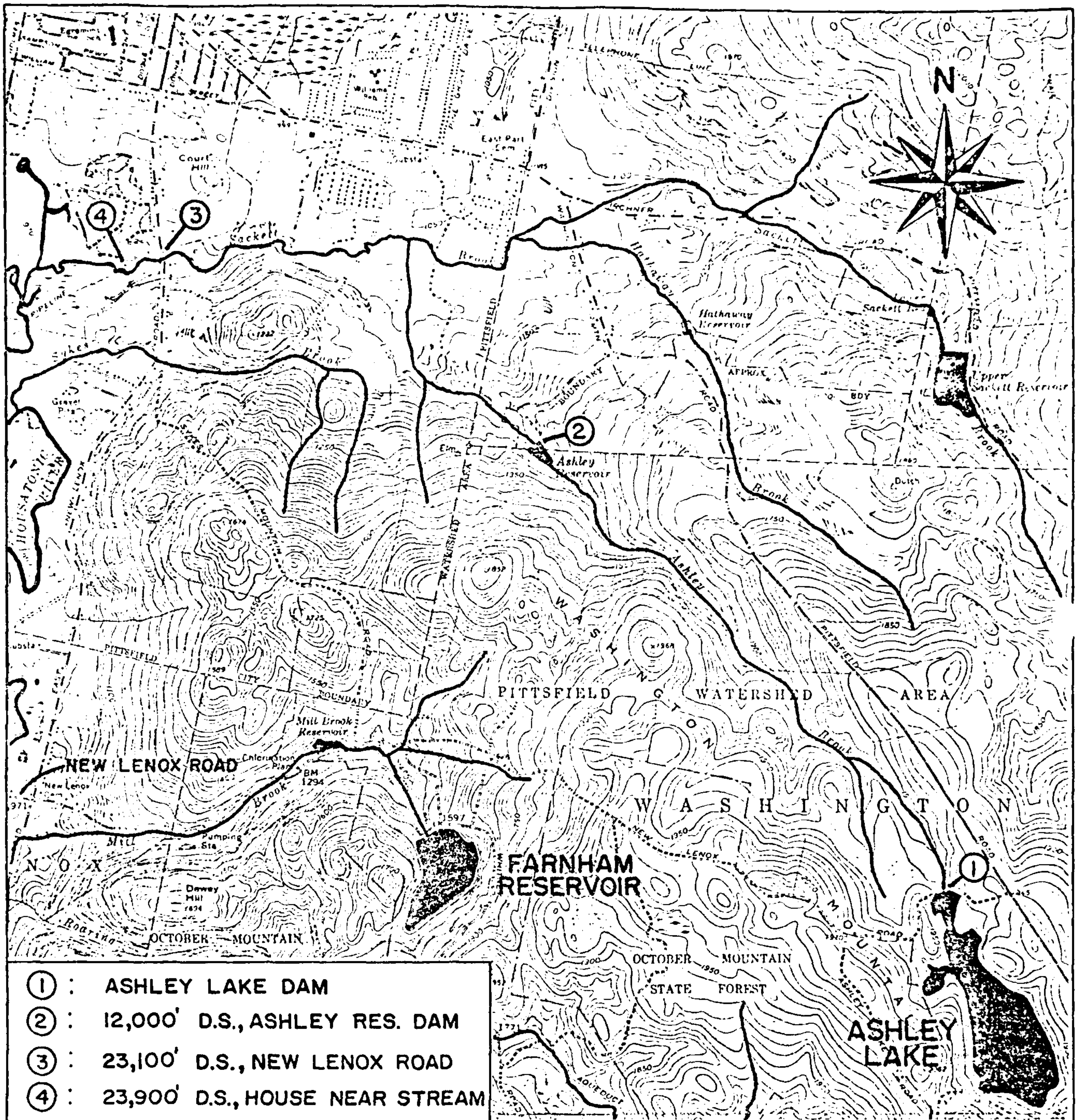
1.45 sq. in × 0.143 sq mi/sq. in = 0.21 sq. miles

3. @ Elevation 1940

1.82 sq. in × 91.83 Acres/sq. in = 167 Acres

1.82 sq. in × 0.143 sq. mi/sq. in = 0.26 sq. miles





-SCALE-

1000' 0 1000' 2000' 3000' 4000' 5000'

FROM: U.S.G.S. PITTSFIELD EAST, MASS. QUADRANGLE MAP

QUADRANGLE LOCATION

TIGHE & BOND / SCI CONSULTING ENGINEERS EASTHAMPTON, MASS.	U.S.ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

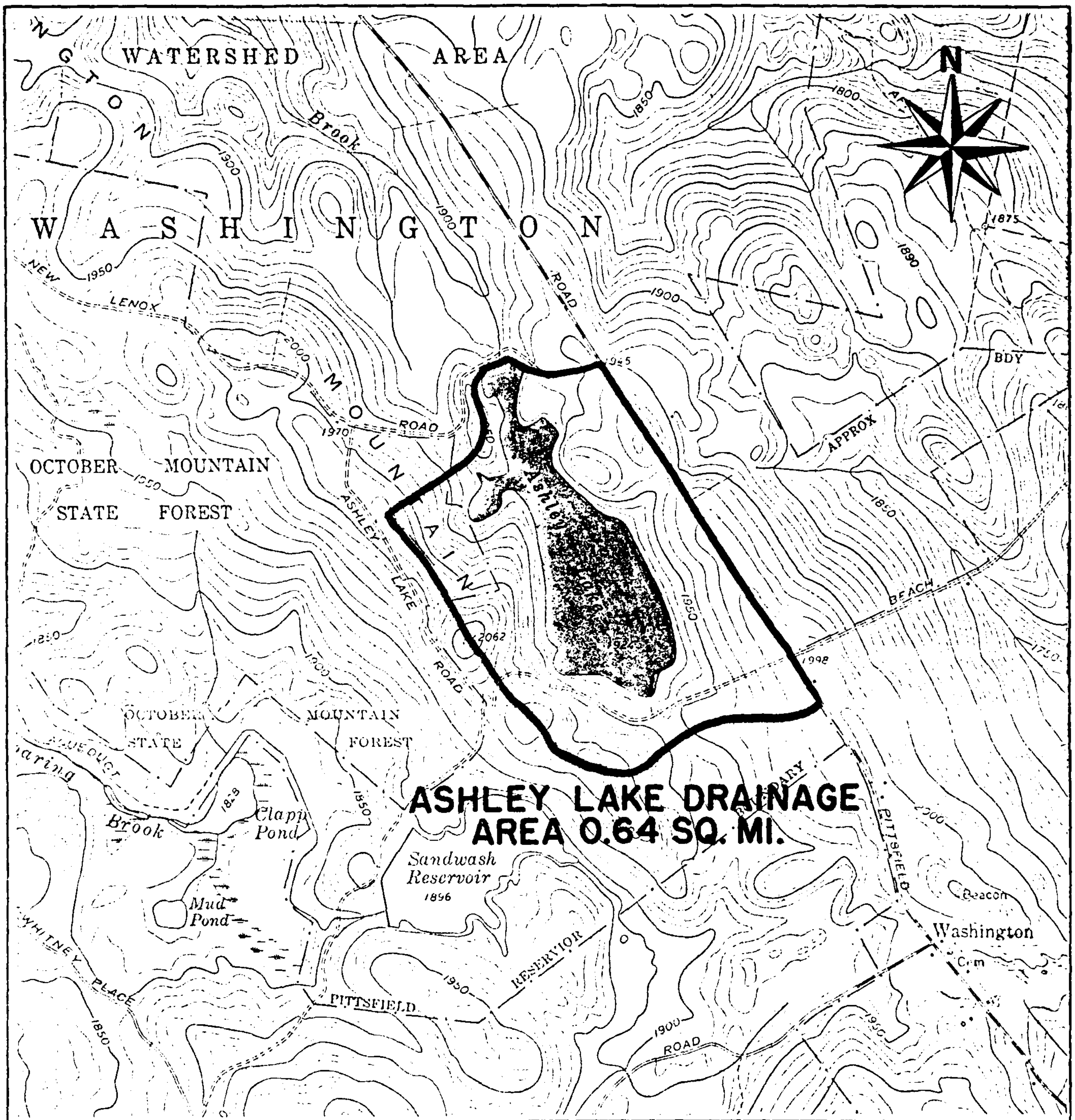
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND DOWNSTREAM HAZARD MAP

ASHLEY LAKE DAM (MA00313) WASHINGTON
BERKSHIRE COUNTY MASSACHUSETTS

SCALE: AS NOTED

DATE: FEBRUARY 1980



-SCALE-

1000' 0 1000' 2000' 3000'

FROM: USGS EAST LEE, AND PITTSFIELD EAST, MASS. QUADRANGLE MAPS

TIGHE & BOND / SCI CONSULTING ENGINEERS EASTHAMPTON, MASS.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

DRAINAGE AREA MAP

ASHLEY LAKE DAM (MA 00313)
BERKSHIRE COUNTY

WASHINGTON
MASSACHUSETTS

SCALE: AS NOTED

DATE: FEBRUARY 1980

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

Assume $y = 5'$

$A = 5.5y^2 = 5.5(5)^2 = 137.5$ s.f.

$R = 0.495y = 0.495(5) = 2.475$

$S = 0.05$

$Q = \frac{1.486}{0.03}(137.5)(2.475)^{2/3}(0.05)^{1/2}$

$Q = (49.5333)(137.5)(1.835)(0.2236)$

$Q = 2795$ c.f.s.

Assume $y = 10'$

$A = 5.5y^2 = 5.5(10)^2 = 550$ s.f.

$R = 0.495y = 0.495(10) = 4.95$

$S = 0.05$

$Q = \frac{1.486}{0.03}(550)(4.95)^{2/3}(0.05)^{1/2}$

$Q = (49.5333)(550)(2.92)(0.2236)$

$Q = 17{,}787$ c.f.s.

Assume $y = 20'$

$A = 5.5y^2 = 5.5(20)^2 = 2{,}200$ s.f

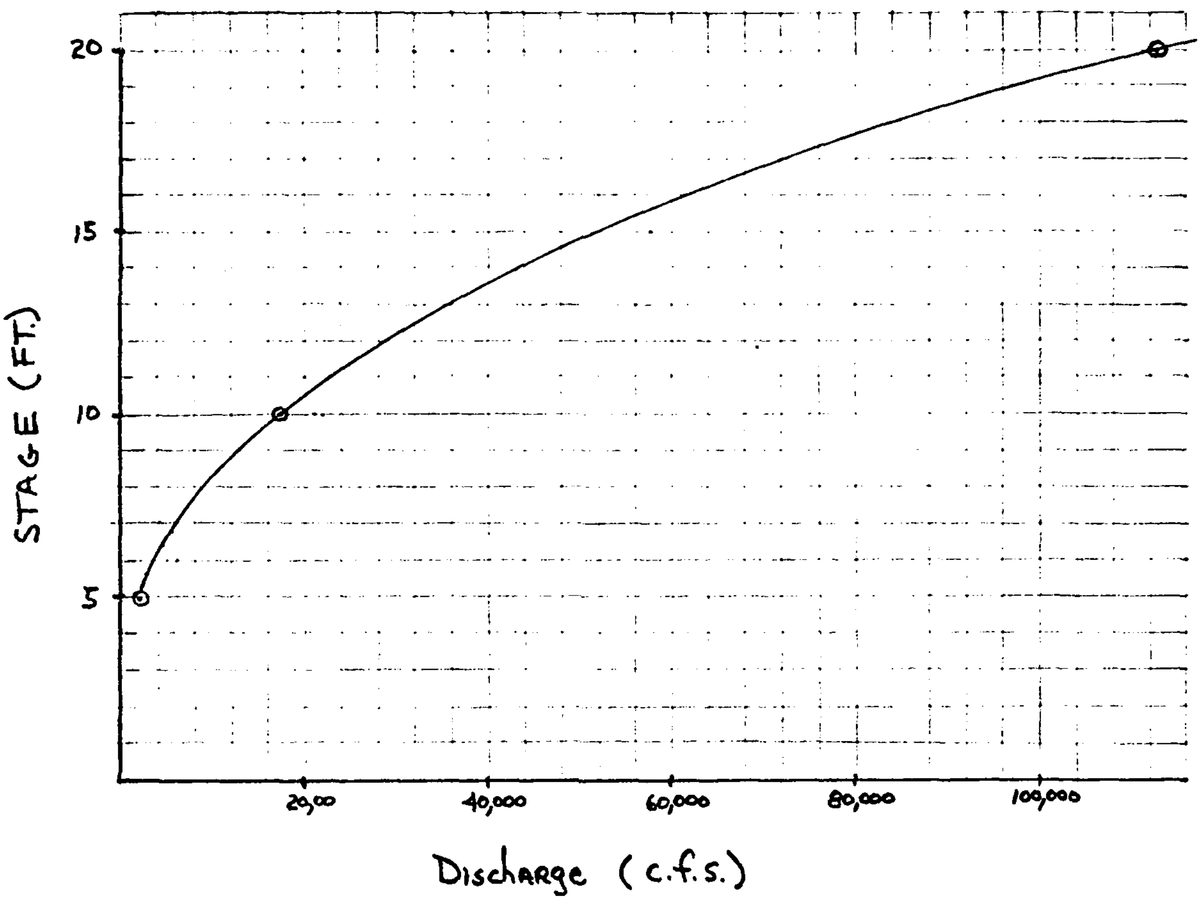
$R = 0.495y = 0.495(20) = 9.9$

$S = 0.05$

$Q = \frac{1.486}{0.03}(2{,}200)(9.9)^{2/3}(0.05)^{1/2}$

$Q = (49.5333)(2{,}200)(4.646)(0.2236)$

$Q = 113{,}206$ c.f.s.



A) Calculate the stage of the brook prior to dam failure

$Q = 725$ cfs

stage $= 1 \pm$ ft

$$\text{Storage Vol} = 12{,}000 \; \frac{(5.5(1.0)^2)}{43{,}560} = 1.5 \text{ ac. ft.}$$

Feb. 8, 1980 Ashley Lake Dam checked by: Moe

REVISED BY: OHD

B) Calculate the stage after dam failure

Channel Vol. = Reach × Area

$Q = 20{,}000$ cfs

from graph on page 13 $y = 10.5$ ft

$$Vol = (12{,}000')\left(\frac{5.5\,(10.5)^2}{43{,}560}\right) - 1.5 = 188.5 \text{ ac. ft.}$$

$S = 1{,}440$ Ac-ft

$$Q_{P_2}\,(\text{TRIAL}) = Q_{P_1}\left(1 - \frac{V_1}{S}\right)$$

$$= 20{,}000\left(1 - \frac{188.5}{1{,}440}\right) = 17{,}400 \text{ cfs}$$

Using Q_{P_2} (TRIAL) = 17,400 c.f.s.

from graph on page 13 $y = 10.0$ ft.

$$V_2 = (12{,}000)\left(\frac{5.5\,(10)^2}{43{,}560}\right) - 1.5 = 150 \text{ ac. ft.}$$

$V = 150$ Ac.-ft.

$$V_{AVG} = \frac{V_1 + V_2}{2} = \frac{188.5 + 150}{2} = 169 \text{ Ac-ft.}$$

$$\therefore \quad Q_{P_2} = Q_{P_1}\left(1 - \frac{V_{AVG}}{S}\right)$$

$$= 20{,}000\left(1 - \frac{169}{1440}\right) = 17{,}700$$

$Q_{P_2} = 17{,}700$ c.f.s.

from graph on page 13 $y = 10.0$ ft.

Flow over the Top of Ashley Res. Dam

$Q = 17{,}700$ c.f.s.

$$H = \left(\frac{Q}{3.0\,L}\right)^{2/3} = \left(\frac{17{,}700}{3.0\,(300)}\right)^{2/3} = (19.7)^{2/3} = 7.4$$

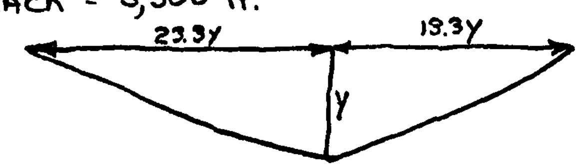
Depth over top of dam $\approx \frac{2}{3}(7.4) = 4.9$ feet

For the purposes of these calculations, we have assumed that the flow from the Ashley Lake Dam failure will only overtop the Ashley Reservoir Dam. Therefore, we have not calculated any additional effect on the downstream conditions that would have been caused by the additional flow from the Ashley Reservoir Dam failure.

Likewise, we have not calculated the effect of the old Ashley Reservoir Dam which is still in place downstream of the new Ashley Reservoir Dam. We have assumed that the flow will be of such magnitude that the old dam will either fail or the existing holes will be enlarged by the force of the Test Flood and dam failure flow.

3) Compute effect at point at end of woodland

Reach = 3,500 ft.



$$\text{Area} = \frac{23.3y^2}{2} + \frac{13.3y^2}{2} = 18.3y^2$$

$$W.P. = 23.3^{+}y + 13.3^{+}y \simeq 36.7y$$

$$S = \frac{1250 - 1070}{3,500} = 5^{+}\% = 0.05$$

$$R = A/W.P. = \frac{18.3y^2}{36.7y} = 0.499y$$

$$n = 0.03$$

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

Assume $y = 5'$

$A = 18.3y^2 = 18.3(5)^2 = 457.5$ s.f.

$R = 0.499y = 0.499(5) = 2.495$

$S = 0.05$

$$Q = \frac{1.486}{0.03}(457.5)(2.495)^{2/3}(0.05)^{1/2}$$

$$Q = (49.5333)(457.5)(1.845)(0.2236)$$

$Q = \underline{9348.8}$ c.f.s.

Assume $y = 10'$

$A = 18.3y^2 = 18.3(10)^2 = 1830$ s.f.

$R = 0.499y = 0.499(10) = 4.99$

$S = 0.05$

$$Q = \frac{1.486}{0.03}(1830)(4.99)^{2/3}(0.05)^{1/2}$$

$$Q = (49.5333)(1830)(2.936)(0.2236)$$

$Q = \underline{59,508 \text{ c.f.s}}$

Assume $y = 8$

$A = 18.3y^2 = 18.3(8)^2 = 1171.2$ s.f.

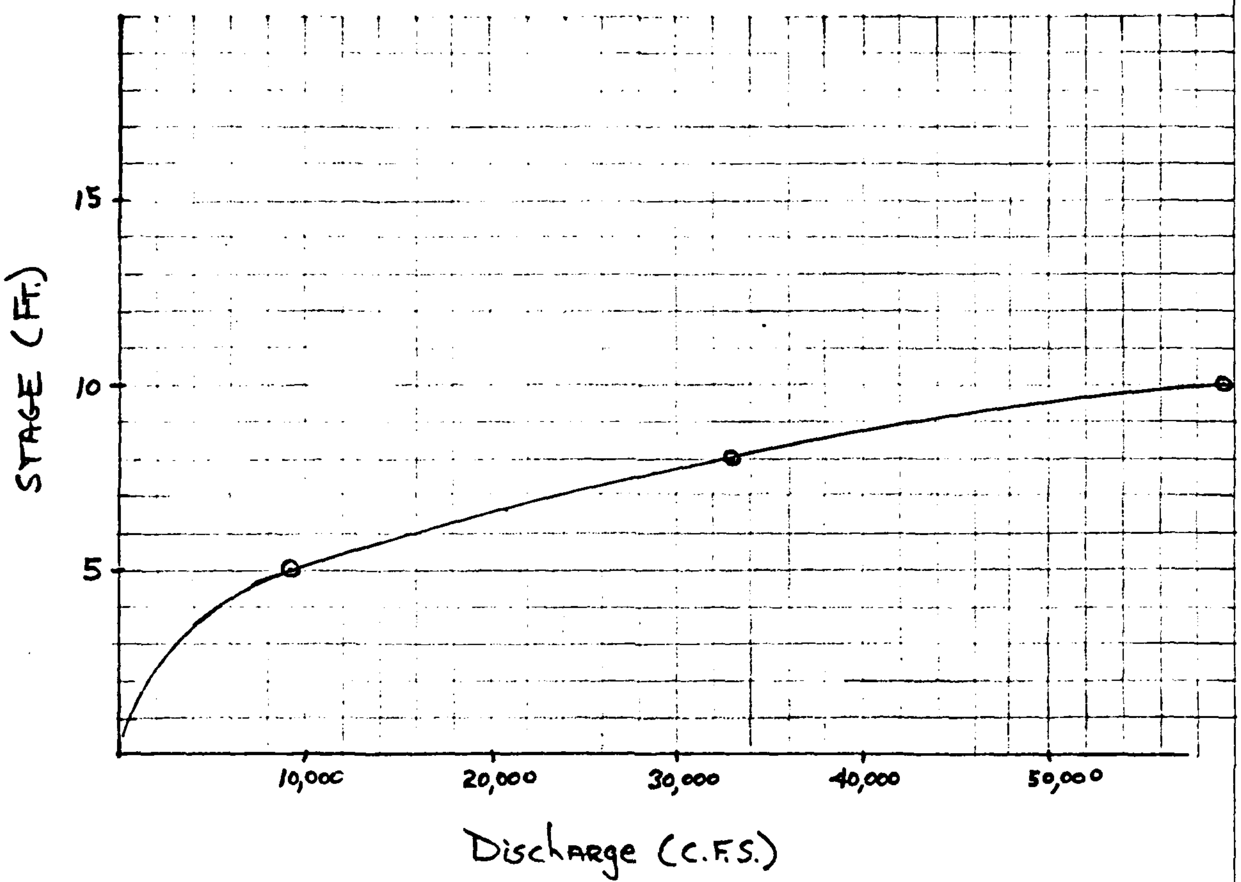
$R = 0.499y = 0.499(8) = 3.992$

$S = 0.05$

$$Q = \frac{1.486}{0.03}(1171.2)(3.99)^{2/3}(0.05)^{1/2}$$

$$Q = (49.5333)(1171.2)(2.527)(0.2236)$$

$Q = \underline{32,780 \text{ c.f.s.}}$



A) Calculate the stage of the brook prior to dam failure

$Q = 725$ cfs

stage $= 1 \pm$ ft

$$\text{Storage Vol} = 3500\ \frac{(18.3(1.0)^2)}{43,560} = 1.5 \text{ ac.ft.}$$

B) Calculate the stage after dam failure

Channel Vol = Reach x Area

$Q = 17{,}000$ cfs

from graph on page 17 $y = 6.2$ ft.

$$Vol = (3{,}500)\left(\frac{18.3\,(6.2)^2}{43{,}560}\right) - 1.5 = 55 \text{ ac. ft.}$$

$S = 1{,}440$ Ac-ft.

$$Q_{P_2}\,(\text{TRIAL}) = Q_{P_1}\left(1 - \frac{V_1}{S}\right)$$

$$= 17{,}700\left(1 - \frac{55}{1{,}440}\right) = 17{,}000 \text{ cfs}$$

Using Q_{P_2} (TRIAL) = 17,000 cfs.

from graph on page 17 $y = 6.1$ ft

$$V_2 = (3{,}500)\left(\frac{18.3\,(6.1)^2}{43{,}560}\right)$$

$V_2 = 53$ Ac-ft

$$V_{AVG} = \frac{V_1 + V_2}{2} = \frac{55 + 53}{2} = 54 \text{ Ac-ft}$$

$$\therefore\ Q_{P_2} = Q_{P_1}\left(1 - \frac{V_{AVG}}{S}\right)$$

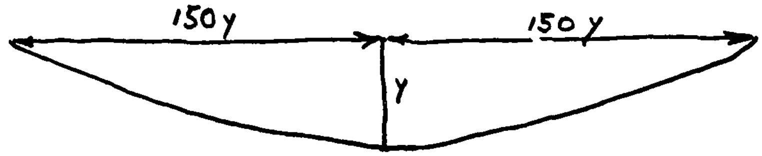
$$= 17{,}700\left(1 - \frac{54}{1440}\right)$$

$Q_{P_2} = 17{,}000$ c.f.s.

from graph on page 17 $y = 6.1$ feet

4) Compute effect at point just downstream of confluence with Sackett Brook. Take typical section at point 4 to represent the reach from point 3 to point 5.

Reach = 2,600 ft



$$\text{Area} = \frac{150y^2}{2} + \frac{150y^2}{2} = 150y^2$$

$$W.P. = 300.1y$$

$$S = \frac{1070 - 1020}{2{,}000} = 50/2{,}000 = 0.025$$

$$R = A/W.P. = \frac{150y^2}{300.1y} = 0.500y$$

$$n = 0.03$$

Compute various points for y to attain Q

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

Assume $y = 2$ ft.

$$A = 150y^2 = 150(2^2) = 600 \text{ s.f.}$$

$$R = 0.500y = 0.5(2) = 1$$

$$S = 0.025$$

$$Q = \frac{1.486}{0.03}(600)(1)^{2/3}(0.025)^{1/2}$$

$$Q = (49.5333)(600)(1)(0.15811)$$

$$Q = 4{,}699 \text{ c.f.s.}$$

Assume $y = 3$ ft

$A = 150y^2 = 150(3^2) = 1{,}350$ s.f.

$R = 0.5y = 0.5(3) = 1.5$

$S = 0.025$

$Q = \frac{1.486}{0.03}(1{,}350)(1.5)^{2/3}(0.025)^{1/2}$

$Q = (49.5333)(1{,}350)(1.003)(0.15811)$

$Q = 10{,}626$ c.f.s.

Assume $y = 5$ ft

$A = 150y^2 = 150(5^2) = 3{,}750$

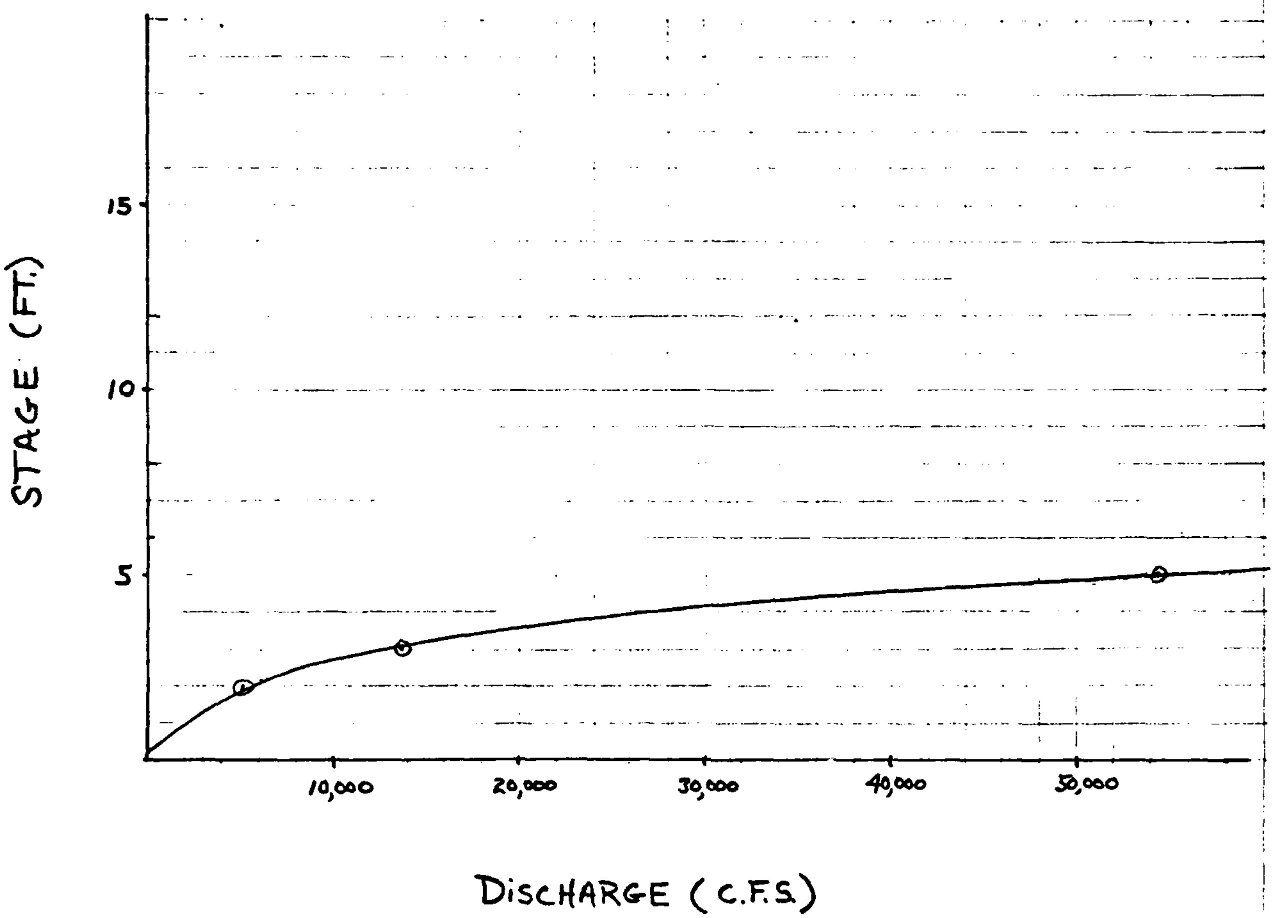
$R = 0.5y = 0.5(5) = 2.5$

$S = 0.025$

$Q = \frac{1.486}{0.03}(3{,}750)(2.5)^{2/3}(0.025)^{1/2}$

$Q = (49.5333)(3{,}750)(1.8477)(0.15811)$

$Q = 54{,}263$ c.f.s.



A) Calculate the stage of the brook prior to dam failure

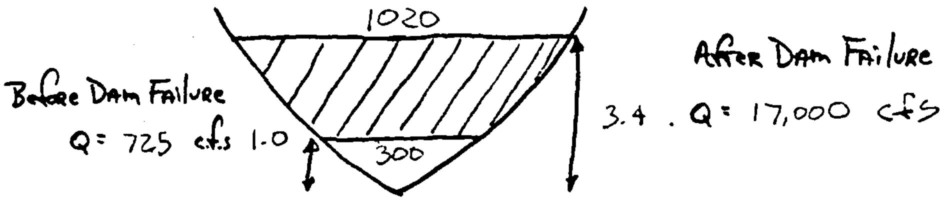
Q = 725 CFS

Stage = < 1 ft

B) Calculate the stage after dam failure

$Q = 17{,}000$

from graph on page 21 $y = 3.4$



Channel Vol = Reach x Area

$$VOL = (2600')\left(\frac{\frac{1020+300}{2}}{43{,}560}\right)(1.6')$$

$$Vol = 95 \text{ Ac-ft}$$

$$Q_{P_2}(\text{TRIAL}) = Q_{P_1}\left(1 - \frac{V_1}{S}\right)$$

$$= 17{,}000\left(1 - \frac{95}{1{,}440}\right)$$

$$Q_{P_2}(\text{TRIAL}) = 15{,}900 \text{ c.f.s.}$$

Using Q_{P_2} TRIAL = 15,900 c.f.s. from graph on page 21 $y = 3.3$ ft

$$V_2 = (2{,}600)\left(\frac{\frac{990+300}{2}}{43{,}560}\right)(2.3)$$

$$V_2 = 86 \text{ ac. ft}$$

$$V_{AVG} = \frac{V_1 + V_2}{2} = \frac{95 + 86}{2} = 91 \text{ Ac-ft}$$

$$\therefore Q_{P_2} = Q_{P_1}\left(1 - \frac{V_{AVG}}{S}\right)$$

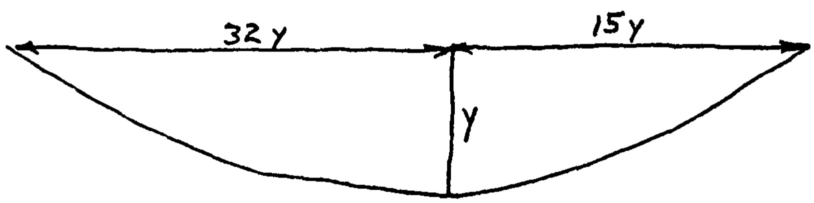
$$= 17{,}000\left(1 - \frac{91}{1440}\right)$$

$$Q_{P_2} = 15{,}900 \text{ c.f.s.}$$

$$Q_{TOTAL} = 15{,}900 \text{ c.f.s.}$$

5) Compute effect at point of crossing East New Lenox Road

Reach = 5,000 ft



$$\text{Area} = \frac{32y^2}{2} + \frac{15y^2}{2} = 23.5y^2$$

$$W.P. \approx 47.1y$$

$$S = \frac{1015 - 970}{5{,}000} = 0.009$$

$$R = A/W.P. = 23.5y^2/47.1y = 0.499y$$

$$n = 0.03$$

Compute various points for y to attain Q

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

Assume $y = 2$

$$A = 23.5y^2 = 23.5(2)^2 = 94 \text{ s.f.}$$

$$R = 0.499y = 0.499(2) = 0.998$$

$$S = 0.009$$

$$Q = \frac{1.486}{0.03}(94)(0.998)^{2/3}(0.009)^{1/2}$$

$$= (49.5333)(94)(0.999)(0.09487)$$

$$Q = 441 \text{ c.f.s.}$$

Assume $y = 5$

$$A = 23.5y^2 = 23.5(5)^2 = 587.5 \text{ s.f.}$$

$$R = 0.499y = 0.499(5) = 2.495$$

$$S = 0.009$$

$$Q = \frac{1.486}{0.03}(587.5)(2.495)^{2/3}(0.009)^{1/2}$$

$$= (49.5333)(587.5)(1.845)(0.09487)$$

$$Q = 5{,}094 \text{ c.f.s.}$$

Assume $y = 10$

$$A = 23.5y^2 = 23.5(10)^2 = 2350 \text{ s.f.}$$

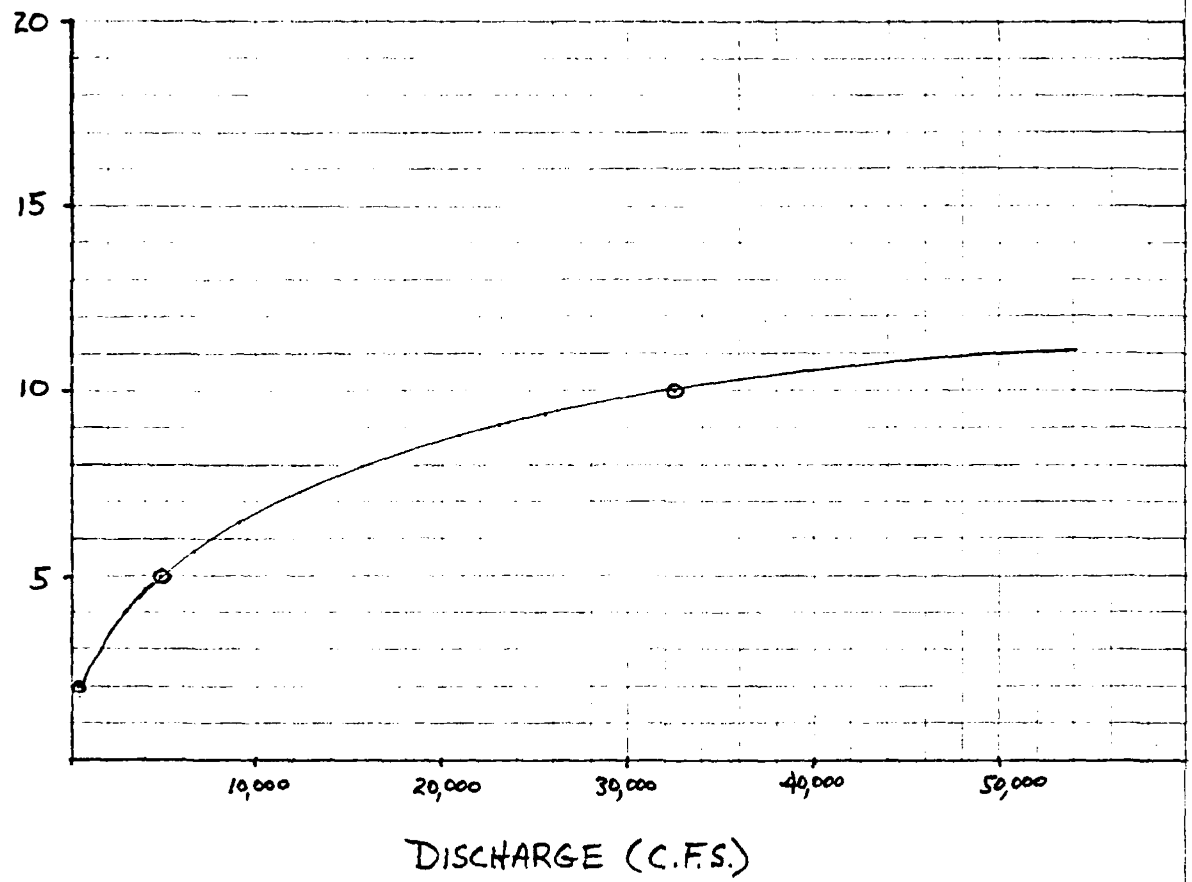
$$R = 0.499y = 0.499(10) = 4.99$$

$$S = 0.009$$

$$Q = \frac{1.486}{0.03}(2350)(4.99)^{2/3}(0.009)^{1/2}$$

$$Q = (49.5333)(2350)(2.936)(0.09487)$$

$$Q = 32{,}423 \text{ c.f.s.}$$



A) Calculate the stage of the brook prior to dam failure

Q = 725 CFS

stage = 2.0 ft

AD-A154 497 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS ASHLEY LAKE DAM MA 00..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV FEB 80 2/2

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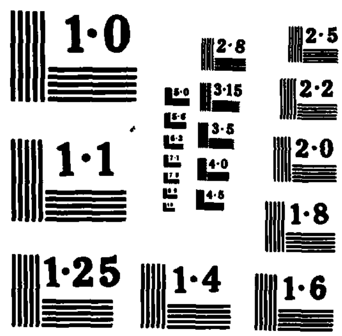
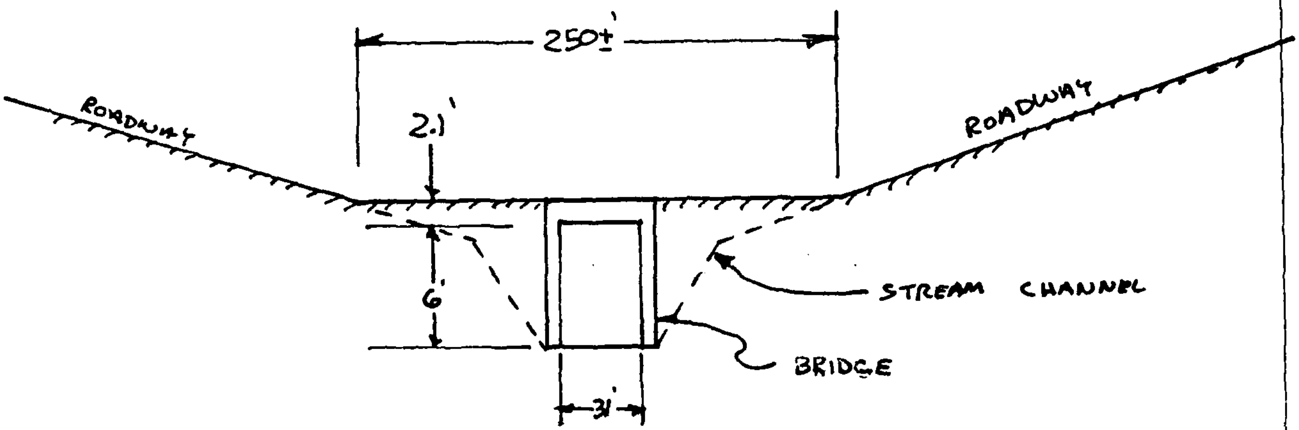

1·0
2·8
2·5
3·15
2·2
3·5
1·1
2·0
4·0
4·5
1·8
1·25
1·4
1·6

Flow Thru Bridge at Sackett Brook & East New Lenox Road:



Pre-Failure Flow:

$Q = 745$ cfs

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$$Q = \frac{1.486}{0.03}(186)(4.3)^{2/3}(0.01)^{1/2}$$

$Q = 2448$ CFS — open channel flow no surcharge.

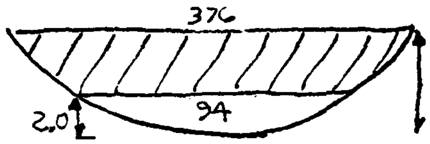
$745 < 2448$ ∴ bridge capacity is adequate
roadway not overtopped.

B) Calculate the effects after dam failure

$Q = 15{,}900$ c.f.s

From graph on page 25, $y = 8.0$ ft

Before Dam Failure
$Q = 725$ c.f.s.



After Dam Failure
feet $Q = 15{,}900$ c.f.s.

Channel Vol = Reach × Area

$$= (5{,}000)\left(\frac{\frac{376+94}{2}}{43{,}560}\right)(6)$$

$$\text{Vol} = 162 \text{ Ac-ft}$$

$$Q_{P_2}(\text{trial}) = Q_{P_1}\left(1 - \frac{V_1}{S}\right)$$

$$= 15{,}900\left(1 - \frac{162}{1440}\right) = 14{,}100 \text{ cfs}$$

$Q_{P_2}(\text{trial}) = 14{,}100$ c.f.s. from graph on page 25 $y = 7.7$ ft

$$V_2 = (5{,}000)\left(\frac{\frac{362+94}{2}}{43{,}560}\right)(5.7)$$

$$V_2 = 149 \text{ Ac-ft}$$

$$V_{AVG} = \frac{V_1 + V_2}{2} = \frac{149 + 162}{2} = 156 \text{ Ac-ft}$$

$$\therefore Q_{P_2} = Q_{P_1}\left(1 - \frac{V_{AVG}}{S}\right)$$

$$= 15{,}900\left(1 - \frac{156}{1440}\right)$$

$Q_{P_2} = 14{,}200$ c.f.s. $\quad y = 7.7$ ft.

$y_1 = y_2 \therefore Q_{P2} = 14{,}200$ cfs

Flow Over East New Lenox Road after Failure:

Bridge Capacity Surcharged To Road.

$$Q = AV$$

$$V = \sqrt{(2)(32.2)(5.1)} = 18 \text{ FPS}$$

$$Q = (6)(31)(18.1) = 3370 \text{ cfs}$$

use $\underline{\underline{3,400 \text{ cfs}}}$

Dam Failure Flow = 14,200 cfs

$\therefore$ Q over road = 14,200 − 3,400 = 10,800 cfs

if L = 250' (See Section on page. 26)

then $H = \left(\frac{10,800}{(3)(250)}\right)^{2/3}$

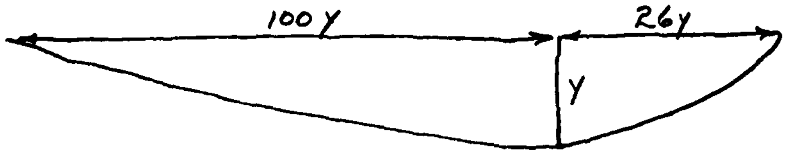
$H = 6$ ft

Depth over road = $2/3\,(6) = 4$ ft

$\therefore$ Roadway overtopped by 4.0 ft

c) Compute effect at the Housatonic River

Typical Section at Point 7



$$\text{Area} = \frac{100y^2}{2} + \frac{26y^2}{2} = 63y^2$$

$$W.P. \approx 126.2y$$

$$S = \frac{970-948}{3{,}200} = 0.007$$

$$R = A/W.P. = 63y^2/126.2y = 0.499y$$

$$n = 0.03$$

Compute various points for y to attain Q

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

Assume $y = 2$ ft

$$A = 63y^2 = 63(2)^2 = 252 \text{ s.f.}$$

$$R = 0.499y = 0.499(2) = 0.998$$

$$S = 0.007$$

$$Q = \frac{1.486}{0.03}(252)(0.998)^{2/3}(0.007)^{1/2}$$

$$Q = (49.5333)(252)(0.999)(0.08367)$$

$$Q = 1{,}043 \text{ c.f.s.}$$

Assume $y = 5$ ft

$$A = 63y^2 = 63(5)^2 = 1575 \text{ s.f.}$$

$$R = 0.499y = 0.499(5) = 2.495$$

$$S = 0.007$$

$$Q = \frac{1.486}{0.03}(1575)(2.495)^{2/3}(0.007)^{1/2}$$

$$Q = (49.5333)(1575)(1.845)(0.08367)$$

$$Q = 12{,}043 \text{ c.f.s.}$$

Assume $y = 10$ ft

$$A = 63y^2 = 63(10)^2 = 6300 \text{ s.f.}$$

$$R = 0.499y = 0.499(10) = 4.99$$

$$S = 0.007$$

$$Q = \frac{1.486}{0.03}(6300)(4.99)^{2/3}(0.007)^{1/2}$$

$$Q = (49.5333)(6300)(2.936)(0.08367)$$

$$Q = 76{,}659 \text{ c.f.s.}$$

Assume $y = 15$ ft

$$A = 63y^2 = 63(15)^2 = 14{,}175 \text{ s.f.}$$

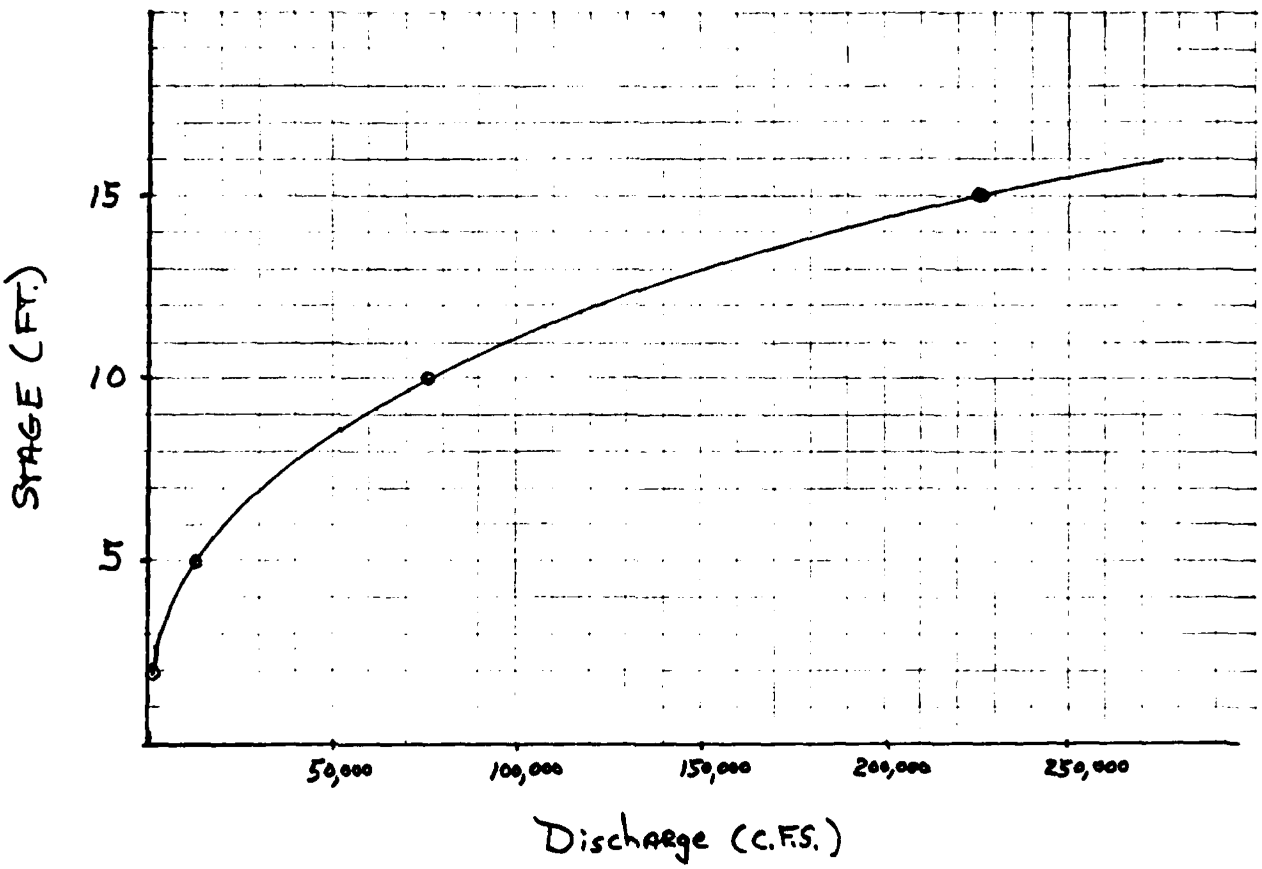
$$R = 0.499y = 0.499(15) = 7.485$$

$$S = 0.007$$

$$Q = \frac{1.486}{0.03}(14{,}175)(7.485)^{2/3}(0.007)^{1/2}$$

$$Q = (49.5333)(14{,}175)(3.852)(0.08367)$$

$$Q = 226{,}296 \text{ c.f.s.}$$



A) Stage of River Prior To Dam Failure

$Q = 725$ cfs

Stage $= < 1$ ft

B) Stage of River After Dam Failure

$Q = 14{,}200$ cfs

Stage $= 5.0$ ft

Sackett Brook joins the Housatonic River in a broad floodplain area. The next downstream hazard area is the crossing of New Lenox Road about 10,000 ± ft downstream of the confluence. Between the confluence and New Lenox Road there is over 500 acres of floodplain area which will attenuate the dam failure flow to a flow which is no longer threatening. The dam failure flow will not constitute a hazard to any houses or development downstream of the confluence.

End of Calculations

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR. DIST.	STATE	COUNTY	CONGR. DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
MA	313	NED	MA	003	01				ASHLEY LAKE DAM	4223.3	7309.9	21MAR80

POPULAR NAME	NAME OF IMPOUNDMENT
ASHLEY LAKE DAM	ASHLEY LAKE

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	10	ASHLEY BROOK	CITY OF PITTSFIELD	3	57000

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
RFPGRE	1901	S	21	21	1440	1120	NED	N	N	N	N	

REMARKS
21 STONE MASONARY CONSTRUCTION WITH TWO EARTHEN EMBANKMENTS

D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	650	C	12	400												

OWNER	ENGINEERING BY	CONSTRUCTION BY
CITY OF PITTSFIELD	E A ELLSWORTH	

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
		NONE	

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
TIGHE & BOND DIV OF SCI	07NOV79	PL92-367

REMARKS
5 - AT TOP OF DAM

END

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